A Horton.
Helena, Mont.

Digitized by the Internet Archive
in 2018 with funding from
Getty Research Institute

https://archive.org/details/carpentrybuildin4188unse

INDEX.

Adjustable Drawing Stand..... 229
Adjustable Saw Handle..... 163
Adjustable Wooden Miter Box..... 57
Air Supply for Heating Apparatus..... 221
Alabastine..... 17
Alarms, Burglar..... 128
Amateur Photography..... 99
American vs. English Skill..... 231
Anchors for Building..... 59
Ancient Casting..... 234
Ancient Mortar 156
Aniline, Solvent for..... 16
Arc, Striking to Given Dimensions..... 17
Architect's Specification..... 238
Architectural Iron Manufacturers, Society of..... 172
Architectural Structures, Restoration of 159
Architecture, City..... 123
Artistic Grates, Fenders, &c..... 162
Automatic Clutch for Elevators..... 86
Automatic Freight Elevator..... 144
Automatic Hatchway Doors..... 70
Automatic Sprinklers for Fires..... 43

Bake Ovens..... 133, 148
Bailey's Copying Press..... 186
Band Saw Setting Machine..... 48
Band Saw Sharpening Machine..... 186
Barn Cupola..... 39
Bas Reliefs, Terra Cotta..... 101
Baths, Turkish..... 168
Bay Window, Bevels in the Sill of an Octagon..... 15
Belt Tightener, Porter..... 105
Bench, Cabinet Makers'..... 191
Bench Vise, Evans Improved..... 87
Benches, Carpenters'..... 97
Benches, Saw..... 59, 97
Bending a Molding..... 57
Beveled Gear..... 18
Bevels, Hopper..... 165, 236
Bevels in the Sill of an Octagon Bay Window..... 15
Bevels of Hoppers and Hip Roofs Compared..... 18
Bevels of Jack Rafters..... 113
Bevels, W. B. on Hopper..... 18
Blind Hinges..... 240
Block Shave Plane, Improved 9
Blower, Exhaust..... 218
Bob, Improved Steel Plumb..... 186
Boiler Circulation..... 212
Boiler House and Stack..... 90
Bookcases and Sideboards, Corner..... 218
Boring Machine, Improved..... 186
Box, Paper..... 233
Box Window Frames..... 150
Braces, Length of..... 165
Brass from Tarnish, Protection of..... 16
Brick, Enameled..... 104
Brick, Hollow..... 105
Brick Machines..... 131
Bricks, Concrete..... 18
Bricklaying, Instruction in..... 134, 159
Brickwork, Constructive..... 217
Brickwork, Decorative..... 220
Bridge Building, Science in..... 164
Builder, The Government as a..... 122
Builders' Glossary..... 78
Builders' Sheet Metal Work..... 11
Builders' Trade, Country Town the place to Learn..... 15
Building, Anchors for..... 59
Building Business, Prospects of..... 73
Building in Japan..... 23
Building Materials, Exhibition of..... 47
Building Outlook..... 135
Building Without Windows..... 154
Buildings, Comparative Cost of..... 169
Buildings Practicable, Are Fire-Proof... 79
Burglar Alarms..... 128

Cabinetmakers' Bench..... 191
Cabinet Work, Maple for..... 9
Calculating an Octagon Bay Window... 133
Calculating Strains..... 108, 126, 146, 188
Calculating the Pitch of Rafters..... 15
Calculation of Masonry..... 218
Camber in a Howe Truss..... 96, 115, 151
Camber in a Howe Truss, Method of Obtaining..... 216
Canvas Roofs, Painting..... 239
Carpenter Shop, Plan of..... 216, 239
Carpenter, The..... 201
Carpenters' and Cabinetmakers' Bench. 149
Carpenters' Benches..... 97
Carriage Axles, Spindles of..... 218
Carved Decoration..... 81
Carved Work for Interior Decoration... 2
Casting, Ancient..... 234
Casting in a Thin Mold, Metal for..... 240
Cement Floors..... 185
Ceramic Sink..... 48
Characteristic Description..... 133
Characteristics of Figure 9..... 215
Cheap Frame House, Criticisms on a.... 56
Cheap House Plans..... 217
Chimneys, Ventilating..... 191
Chuck for Turning Polygonal Forms.... 32
Church Roof..... 149, 217
Church Roof, Framing a..... 190
Church Roofs..... 239
Circle Drawing with Steel Square 110
Circle, Squaring the..... 168
Circulation, Boiler..... 212
City Architecture..... 123
City vs. Country for Learning Trades.. 168
Clutch Screw-Driver, Double Action... 36
Coal Boxes, Wooden..... 61
Colors for Painting Buildings..... 171
Combination Wardrobe..... 222
Commercial Building, Model..... 158
Competition Design in Elevations and Details of the Eight Room House.... 62
Competition, General Conditions of Seventh..... 120
Competition in Primary School Buildings..... 156
Competition, Result of the Sixth..... 117
Competition, Schoolhouse 220
Competition, Second Prize Design in Sixth..... 153
Competition, Seventh..... 173
Comstock Level..... 142
Concrete Bricks..... 18
Conductor Pipes, Standing Seam..... 36
Construction and Decoration, French... 167
Construction of a Hip Roof..... 238
Construction of Polygons..... 18
Construction of Triangle..... 17
Construction of Window Screens..... 75
Constructive Brickwork..... 217
Contents of a Tapering Log..... 168
Copying Paper, Improved..... 161
Copying Press, Bailey's..... 186
Corner Sideboards and Bookcases..... 218
Corners of Frame Buildings..... 57, 97
Cornice, Equalizing Projection of..... 17
Cornice Gutter..... 15
Correction, A..... 187
Correspondence..15, 37, 55, 75, 91, 110, 131, 148, 164, 190, 215, 235
Corrugated Range Boiler..... 47
Cost of Buildings, Comparative..... 169
Cost of Fires..... 106
Cottage, Painting a..... 131
Cottage Sideboard..... 102
Countersinking Wood Screws..... 142
Country Town the Place to Learn Builders' Trade..... 15
Cracking of Plaster..... 112
Criticisms on the First Prize Design.... 166
Criticisms on the Ten House Plans....58, 96
Cupola, Barn..... 39
Curled Maple, Finishing..... 217
Cypress Timber..... 115
Cypress Timber, Strength of..... 40

Damper Regulators, Kellam's..... 162
Decision in the Fifth Competition..... 54
Decision in the Seventh Competition.... 222
Decoration, Carved..... 81
Decoration, Carved Work for Interior.. 2
Decoration, Influence of Home..... 9
Decorations, Metal..... 229
Decorative Brickwork..... 220
Decorative Process, Valuable..... 140
Defects in Education..... 41
Derby Expansion Bit..... 133
Description, Characteristic..... 49
Design for a Frame House..... 71
Design for Wall Cabinet..... 171
Design for Wooden Mantel..... 22
Designing Molding Knives..... 112
Details, Miscellaneous..... 5
Determiuing the Rise in a Segment, Chord and Diameters Being Given... 17
Diamond, Resharpening a 190
Diaphonic Tiles..... 163
Door Hangers, Prescott's..... 49
Door Knob Attachment, Improved..... 48
Door Knobs, Hidden..... 212
Door Knobs, Improvement in..... 104
Door, Remodeling an ordinary Four-Panel..... 16
Door, Rod for a Double..... 217
Double Position, Rule of..... 239
Drafting Table..... 215
Drawing an Ellipse..... 148
Drawing Ellipses..... 240
Drawing Stand, Adjustable..... 229
Drawings, New Method of Reproducing 35
Driven Wells..... 16
Dry Rot, Prevention of..... 37
Durability of Mortar..... 124
Dutch Ovens 76

Economic Problems..... 57
Education, Defects in..... 46
Eight Room House..... 135
Eight Room House, Third Prize Design in Elevations and Details of..... 193
Elevator, Automatic Clutch for..... 86
Elevator, Automatic Freight..... 144
Ellipse, Drawing an..... 148
Ellipses, Drawing..... 240
Employment for Winter Evenings..... 210
Enameled Brick..... 104
Encaustic Tiles..... 142
English Skill vs. American..... 231
Erecting a Perpendicular by Means of the Dividers and Straight Edge..... 76
Error in Scale..... 224
Estimating, List for..... 216
Estimating Power..... 131

Estimates ... 166
Europe, Highest Building in ... 153
Evans's Improved Bench Vise ... 87
Exhaust Blower ... 218
Exhibition of Building Materials ... 47
Expansion Bit, The Derby ... 71
Experiments in Drawing Scrolls and Ellipses ... 37
Extension Bit and Washer Cutter ... 128
Extension Ladder ... 76

Factories, Arrangement of Windows in. 190
Farm Houses ... 97, 165
Farm Houses, Planning of ... 230
Felix Sliding Door Hanger ... 104
Fences, Gates and ... 107
"Fides," Specification ... 173
Fifth Competition, Decision in ... 54
Figure 9, Characteristics of the ... 166, 215
Figures on the Steel Square ... 216
Figures, Harmony of ... 110
Filtering Materials ... 191
Finishing Curled Maple ... 217
Finishing Hardwood ... 237
Finishing the Edges of Tin Roofs, 19, 76, 132
Fires, Automatic Sprinklers for ... 43
Fires, Cost of ... 106
Fire Proof Buildings Practicable, Are ... 79
Floor Plans, A Study in ... 64
Floor Truss ... 55
Floor Trusses, Strength of ... 91
Floors Cement ... 185
Floors, Strength of ... 75
Foundations, Necessity of Good ... 187
Frame Buildings, Corners of ... 57, 97
Frame House, Criticisms on Cheap ... 56, 95
Frame House, Design for ... 41
Framing a Church Roof ... 190
French Construction and Decoration ... 167
Friezes, Joining Level and Raking ... 78

Gambrel Roofs ... 17
Gates and Fences ... 107
Gear, Beveled ... 18
Glossary, Builders' ... 78
Glue Joint, Making a ... 239
Glue Pot ... 46
Good Foundations, Necessity of ... 187
Government as a Builder ... 122
Grate, "Radiant" ... 8
Grate Setting, New ... 87
Grates, Fenders, &c., Artistic ... 162
Greenlee's Self-Feeding Saw Table ... 142
Gum Wood, Increasing Use of ... 193
Gutter, Cornice ... 15

Hack Saw, Improved ... 163
Hanging Pictures ... 164
Hanging Window Shutters ... 167
Hand-Power Woodworking Machine ... 114
Hand Railing, Problem in ... 38, 77
Hardwood, Finishing ... 237
Harmony of Figures ... 110
Hatchway Doors Automatic ... 70
Heating Apparatus, Air Supply for ... 221
Hemlock ... 68
Henry's Improved Vise ... 143
Hidden Door Knobs ... 212
Highest Building in Europe ... 153
Highest Compliment Yet ... 240
Hinges, Blind ... 240
Hip Roof, Construction of ... 238
Hip Roofs ... 165
Holcomb's Patent ... 110
Hollow Brick ... 105
Home Decoration, Influence of ... 9
Hoop Cutting Machine ... 186
Hopper and Hip Roofs Compared, Bevels of ... 18
Hopper Bevels ... 37, 165, 236
Hopper Bevels by the Square ... 111
Hopper Bevels, W. B. on ... 18
House Building, Progressive Study in ... 23
House Painting, Present Styles of ... 139
House Plans ... 84
House Plans, Cheap ... 217
House Plans, Criticism on the Ten ... 58, 96
Houses, Japanese ... 38
Houses, Ready-made ... 130
How to Figure Speed—The Reason Why 29
Howe Truss, Camber in a ... 96
Howe Truss, Method of Obtaining the Camber in ... 216
Howe Trusses, Camber in ... 115
Howe Trusses, Hopper Bevels, &c ... 39

Ice House and Milk House ... 217
Improved Boring Machine ... 186
Improved Copying Paper ... 161
Improved Door Knob Attachment ... 48
Improved Hack Saw ... 163
Improved Wheel Pipe Cutter ... 228
Improvement in Door Knobs ... 104
Improvements, Stimulating ... 47
Improvements, Uncle Dave's ... 132
Improvised Tools ... 164
Increasing Use of Gum Wood ... 193
Instruction in Bricklaying ... 134, 159
Interior Decoration, Carved Work for ... 2
Interior Finish, Moldings for ... 88
Invention, Necessity and ... 82
Iron Work, Ornamental ... 222
Itineraut Fraud ... 164

Jack Rafters, Bevels of ... 113
Japan, Building in ... 23
Japanese Houses ... 83
Japanese Tools ... 132
Joining Level and Raking Friezes ... 78
Joining Roofs of Different Pitches ... 60
Joints, Strength of ... 216
"Jumbo," Specification ... 182

Kellam's Damper Regulator ... 162
Kerfing ... 56, 96
Knives, Designing Molding ... 112
Knives, Molding ... 19, 77
Knobs, Hidden Door ... 212

Labels on Tin, Fastening ... 16
Ladder, Extension ... 76
Ladders ... 185
Latch, Refrigerator ... 143
Length and Pitch of Rafters ... 238
Length of Braces ... 165
Length of Rafters ... 169
Level, Comstock ... 142
Lightning Rods ... 226
Lining Shafting ... 167
List for Estimating ... 216
Locks, Improvement in Door ... 129
Log, Contents of a Tapering ... 168
Long Island Terra Cotta Works ... 160
Lumber, Terra Cotta ... 46, 161

Machines, Brick ... 131
Making a Glue Joint ... 239
Making a Square Stick Octagonal ... 236
Managing Work ... 37
Management and Use of Ropes ... 34, 52, 68
Mantel, Design for Wooden ... 22
Mantels, Terra Cotta ... 105
Maple for Cabinet Work ... 9
Marquetries, Ready-Made ... 10
Masonry, Calculation of ... 218
Masonry, Measurements of ... 237
Materials for Plastering ... 17
Measurements of Masoury ... 237
Mechanical Schools ... 30
Mechanics Read, What ... 60, 95
Mechanics Telling What They Know ... 78
Mechanics' Tools ... 15
Medart Wrought Rim Pulleys ... 47
Metal Decorations ... 229
Metal for Casting in a Thin Mold ... 240
Method of Obtainiug the Camber in a Howe Truss ... 216
Milk House and Ice House ... 217
Millwrights' Square ... 240
Miscellaneous Details ... 5
Miter Box, Adjustable Wooden ... 57
Model Commercial Building ... 158
Molding, Binding a ... 57
Molding for Interior Finish ... 88
Molding Knives ... 19, 77
Molding Knives, Designing ... 112
Moldings, Painting ... 111
Mortar, Ancient ... 156
Mortar, Durability of ... 124

Nailing, Sliver ... 240
Necessity and Invention ... 82
New Grate Setting ... 87
New Publications, 7, 49, 88, 107, 140, 185, 223
New Tenoning Machine ... 227
New Tumbler Lock ... 105
Night Classes of the Ohio Mechanics' Institute ... 11
Notes and Commeuts ... 2, 30, 69, 88, 102, 125, 194
Novelties ... 8, 36, 47, 70, 86, 104, 128, 142, 160, 186, 212, 227
Novelty Siding, Sections of ... 97

Oak Color, How to Give Pine an ... 63
Octagon Bay Window, Calculating an ... 133
Octagon by Pocket Rule, Laying Off an ... 133
Ohio Mechanics' Institute, Night Classes of ... 11
Oil and Varnish, Removing ... 218
Old Walls, Repairing ... 191
Opera House, Topeka ... 130
Ornamental Iron Work ... 222
Ovens, Bake ... 133, 148
Ovens, Dutch ... 76

Paint, &c., Compound for Removing Varnish ... 9
Paint from Galvanized Iron, Peeling of ... 16
Painting a Cottage ... 131
Painting Buildings, Colors for ... 171
Painting Canvas Roofs ... 239
Painting Moldings ... 111
Painting, Present Style of House ... 139
Paints for Tin Roofs ... 132, 255
Paper Box ... 233
Paper, Policy of the ... 191
Pavements, Peculiar ... 164
Peculiar Pavements ... 164
Peeling of Paint from Galvanized Iron. 16
Peerless Pipe Grip ... 86
Perpendicular by Means of the Divider and a Straight Edge, Erecting a ... 76
Perspective Linead ... 8
Photography, Amateur ... 99
Picture Hanging ... 164
Pine an Oak Color, How to Give ... 63
Pine Floor, How to Color ... 130
Pipe Cutter, Improved Wheel ... 228
Pipe Grip, Peerless ... 86
Pipe, Spiral ... 227
Piping for Three Wash Basins ... 131
Pisa, Visit to ... 231
Pitch of Roofs ... 215
Pitch of Saw Teeth ... 191
Plan of Carpenters' Shop ... 216, 239
Plane, Improved Block Shave ... 9
Planning of Farm Houses ... 230
Plaster, Cracking of ... 112
Plastering, Materials for ... 17
Plumb and Level, Telescopic ... 8
Plumb Bob, Improved Steel ... 186
Pocket Figuring Rules ... 131
Policy of the Paper ... 59, 79, 96, 168, 191
Polish for Wood ... 217
Polygonal Forms, Chuck for Turning ... 32
Polygons, Construction of ... 18
Portable Adjustable Scaffold ... 212
Portable Tool Box ... 131, 190
Portable Workbench ... 58
Porter Belt Tightener ... 105
Power, Estimating ... 131
Practical Stairbuilding ... 6, 50, 71, 106, 144, 167, 211, 232, 235
Practical Window Sash Fastener ... 162
Precious Woods ... 127
Prescott's Door Hangers ... 49
Prevention of Dry Rot ... 37
Primary School Buildings, Competition in ... 156
Prize Design, Third, in Elevations and Detail of Eight-Room House ... 193
Problem in Hand Railing ... 38, 77
Problems, Economic ... 57
Progressive Study in House Building ... 23
Projection of Cornice, Equalizing ... 17
Prospects of Building Business ... 73
Publications, New 7, 49, 88, 107, 140, 185, 223
Pulleys, Medart Wrought Rim ... 47

"Radiant" Grate ... 8
Rafters, Calculating the Pitch of ... 15
Rafters for Third Pitch Roof ... 111
Rafters, Length and Pitch of ... 238
Rafters, Length of ... 169
Raising Truss Roofs ... 167
Range Boiler, Corrugated ... 47
Ready-Made Houses ... 130
Referred to our Readers, 19, 40, 60, 98, 116, 134, 170, 192, 217, 240
Refrigerator Latch ... 143
Remodeling an Ordinary Four-Panel Door ... 16
Removing Oil and Varnish ... 218
Removing Varnish, Paint &c., Compound for ... 9
Repairing Old Walls ... 191
Reproducing Drawings, New Method of 35
Resharpening a Diamond ... 190
Restoration of Architectural Structures 159
Result of the Sixth Competition ... 117
Rod for a Double D or ... 217
Roof, Church ... 149
Roof Construction ... 237
Roof for a Foundry, Sheet Iron ... 167
Roof Over Engine Room, Tin ... 133
Roofs, Church ... 239
Roofs, Gambrel ... 17
Roofs, Hip ... 165
Roof of Different Pitches, Joining ... 60
Roofs, Pitch of ... 215
Roofs, Sheet Iron ... 11

Roofs, Truss 238
Ropes, Management and Use of ... 34, 52, 68
Rule of Double Position 239
Rules, Pocket Figuring 131

Saw Benches 59, 97
Saw Filing 16
Saw Handle, Adjustable 163
Saw Setting Machine, Band 48
Saw Sharpening Machine, Band 186
Saw Table, Greenlee's Self Feeding 142
Saw Teeth, Pitch of 191
Scaffold, Portable Adjustable 212
Scale, Error in 224
Schoolhouse Competition 220
Schools, Mechanical 30
Science in Bridge Building 164
Screw Driver, Double Action Clutch 36
Screwless Window Pulley 71
Scrolls and Ellipses, Experiments in Drawing 37
Sections of Novelty Siding 97
Segment, Determining the Rise in, Chord and Diameter Being Given 17
Segment Heads 78
Seventh Competition 173, 202
Seventh Competition, Decision in 222
Seventh Competition, General Conditions of 120
Shafting, Lining 167
Sheet Iron Roof for a Foundry 167
Sheet Iron Roofs 11
Sheet Metal Work, Builders' 11
Show Windows, Ventilating 113
Sideboard, Cottage 102
Sideboards and Bookcases, Corner 218
Sink, Ceramic 48
Sixth Competition, Elevations and Details of the Eight Room House 62
Sixth Competition, Result of the 117
Sixth Competition, Second Prize Design in 153
Sliding Door Hanger, Felix 104
Sliver Nailing in Hardwood 240
Snowsheds 9
Society of Architectural Iron Manufacturers 172
Solvent for Aniline 16
Specification, Architects' 238
Specification, "Fides" 173
Specification, "Jumbo" 182
Specification, "Star" 176
Speed, How to Figure 29
Spindles of Carriage Axles 218
Spiral Pipe 227
Splicing Ropes 57
Sprinklers for Fires, Automatic 43
Spur Chuck for Wood Turnings 168
Square, Millwrights' 240
Squaring the Circle 168
Stack, Boiler House and 90
Stairbuilders, Tools for 217
Stairbuilding, Practical 211, 232, 235
Stairbuilding, Tools for 240
Stairs, Timbering 165
Standing Seam Conductor Pipe 36
"Star," Specification 176
Steel Square, Circle Drawing with 110
Steel Square, Figures on 217
Stephens Patent Vise 162
Stimulating Improvements 47
Store Fronts 218
Strains, Calculating 108, 126, 146, 188
Stray Chips, 14, 33, 51, 80, 98, 116, 134, 152, 170, 192, 218, 240
Strength of Cypress Timber 40
Strength of Floors 75
Strength of Floor Trusses 91
Strength of Joints 216
Striking an Arc to Given Dimensions 17
Strikes as a Symptom 85, 133
Study in Floor Plans 64
Study in Suburban Architecture 224
Suburban Architecture, Study in 224

Table for Drafting 215
Tarnish, Protecting Brass from 16
Telescopic Plumb and Bevel 8
Ten House Plans 150
Tenoning Machine, New 227
Terra-Cotta Bas Reliefs 101
Terra-Cotta Lumber 105
Terra-Cotta Works, Long Island 160
Thin Mold, Metal for Casting in 240
Third Pitch Roof, Rafters for 111
Third Prize Design in Elevations and Details of the Eight Room House 193
Tidal Wave Water Closet 128
Tiles, Diaphonic 163
Tiles, Encaustic 142
Timber Construction 51
Timber, Cypress 115
Timbering Stairs 165
Tin, Fastening Labels on 15
Tin for Valleys 132, 191
Tin Roof Over Engine Room 133
Tin Roofs, Finishing the Edges of 19, 76, 132
Tin Roofs, Paint for 132, 235
Tin Roofs, White Lead for 39
Tool Box, Portable 131, 290
Tools for Stairbuilders 217
Tools for Stairbuilding 250
Tools, Improvised 164
Tools, Japanese 132
Tools, Mechanics' 15
Topeka Opera House 130
Trades, City vs. Country for Learning 168
Triangle, Construction of 17
Tripolith 227
Truss Roofs 238
Truss Roofs, Raising 167
Trusses, Strength of Floor 91
Tumbler Lock, New 105
Turkish Baths 168

Uncle Dave's Improvements 132

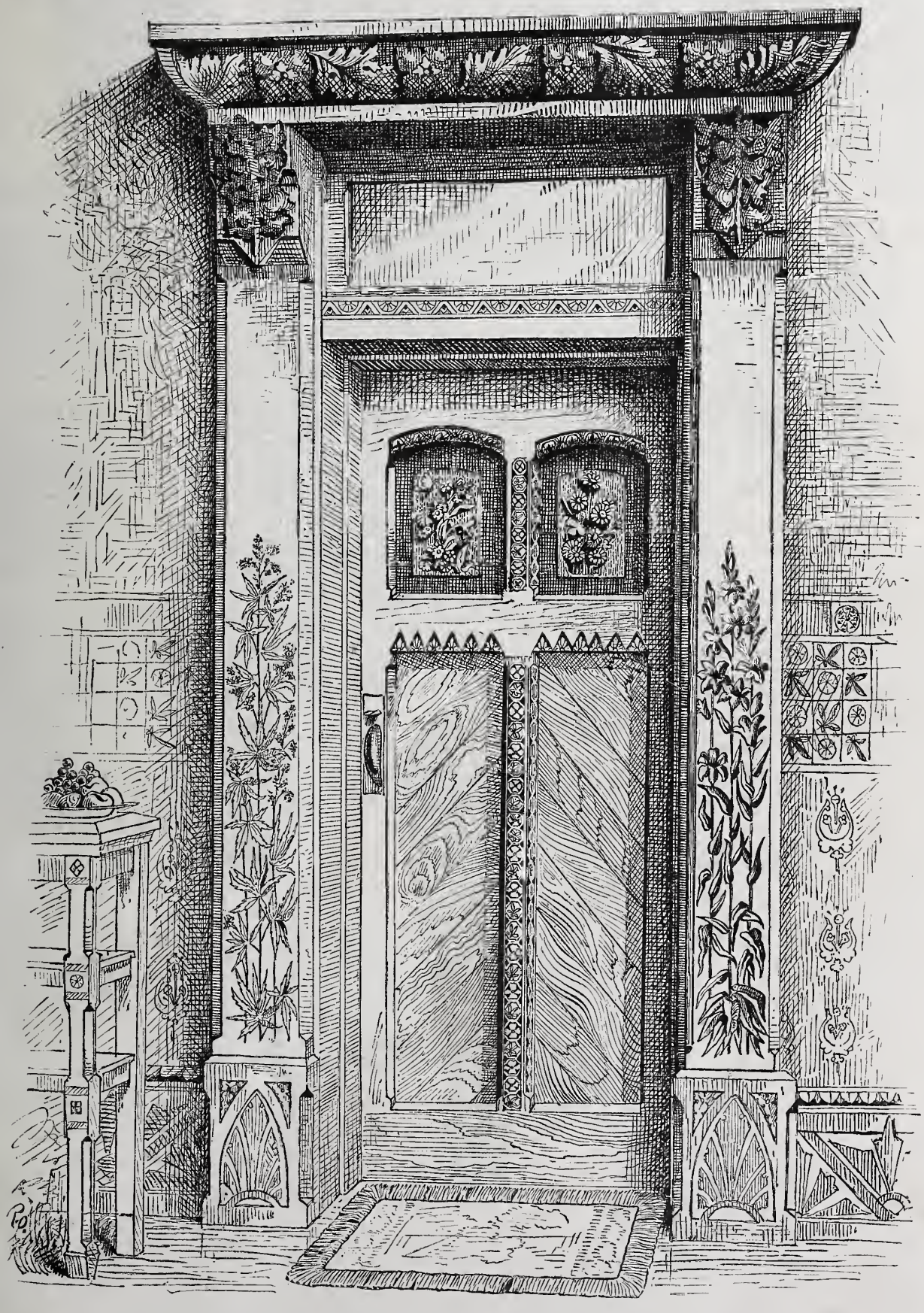
Valleys, Tin for 132, 191
Valuable Decorative Process 140
Varnish and Oil, Removing 218
Varnish, Paint, &c., Compound for Removing 9
Ventilating Chimneys 191
Ventilating Show Windows 113
Ventilation 112
Vise, Evans Improved Bench 87
Vise, Henry's Improved 143
Vise, Stephens Patent 162
Visit to Pisa 231

Wall Cabinet, Design for 171
Wardrobe, Combination 222
Wash Basins, Piping for Three 131
Washer Cutter and Extension Bit 128
Water Closet, Tidal Wave 128
Wells, Driven 16
What Mechanics Read 60, 95
White Lead for Tin Roofs 39
Window Frames, Box 149
Window Pulley, Screwless 71
Window Sash Fastener, Practical 162
Window Screens, Construction of 75
Window Shutters, Hanging 167
Windows, Building Without 154
Windows in Factories, Arrangement of 190
Winter Evenings, Employment for 210
Withholding Information 148
Wooden Coal Boxes 61
Wood Finish 104
Wood, Polish for 217
Wood Screws, Countersinking 142
Wood Turning, Spur Chuck for 168
Woodworking Machine, Hand Power 114
Woods, Precious 127
Workbench, Portable 58
Work, Managing 37

CARPENTRY AND BUILDING

A MONTHLY JOURNAL.

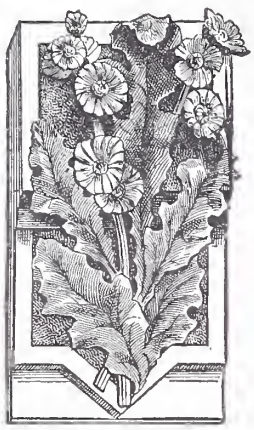
VOLUME IV. NEW YORK—JANUARY, 1882. NUMBER 1.



Carved Work for Interior Decoration.—Fig. 1.—General View of Doorway in Oak and Cherry.

Carved Work for Interior Decoration.

In our volume for last year we presented a series of articles on the subject of wood carving, in which various directions were given for the preparation of models in clay from which to carve, for the use of tools and concerning the manipulation of materials. Continuing the same subject in a general way, we at this time present some examples of the practical application of the art of carving, which show how otherwise very plain features of house finish may be made handsome by a little intelligent work of this kind. Almost every one has, at one time or another, heard of the classes in wood carving in connection with the University of Cincinnati, but few, perhaps, among our readers have an adequate conception of what has really been done. The art department of the University, termed the School of Design, was commenced in 1868, and has steadily grown in importance and usefulness from that time to this. The subjects treated in it are decorative design, water-color painting, drawing and perspective, sculpture and wood carving. It is to the latter that we desire to direct attention at this time, being the subject in which our



Carved Work for Interior Decoration.—Fig. 2.—Detail of Left Mantel Bracket, shown on Opposite Page.—Succory.

readers are specially interested. The illustrations which we present are from work in the house of Mr. Benn Pitman, the teacher of the classes in wood carving.

The work done by the Cincinnati School of Design in the way of wood carving has an originality about it—a marked departure from designs in the customary styles—which renders it quite remarkable. In all its work the mental enjoyment is made to keep pace with the pleasure which is given to the eye. In other words, very little of the work which is done there appeals to the eye alone. An idea is centered in it, wherever it is possible to do so without the appearance of straining for an effect. The poetical character of many of the creations of the school are, no doubt, largely due to the direct personal influence of Mr. Pitman himself, but the principles which he has developed, and the directions which he has given to the work, have largely tended toward making it pleasing in a double sense. Wherever the symbolical or the suggestive can be used, it is introduced, and with the happiest effect. In the use of plant forms to ornament a given piece of work, care is taken to select those which are especially appropriate to the use for which the article is intended.

Our first-page engraving represents a highly ornamented doorway, and though rich to a degree rarely seen even in the most expensive modern houses, it will be found that it has more plain surface than is usual, even in less highly ornamented work. The carving has been done on those places where the ornamentation would be the most effective, and no attempt has been made to spread it. The door itself has four panels. The stiles and rails are cherry, the lower panels being of narrow oak set diagonally. The reason for this is not to be found in the appearance of the parts, nor is it for the sake of regularity. It is done simply because boards so placed can be made tight at the joints, even when they are shrinking. The munting has a chamfer on each edge and a row of rosettes carved in it. The chamfer is decorated with a flat ornament. The upper panels, which are small, are quite elaborately carved, that on the right being in the form of the lobelia, and that on the left of marguerite. The jambs are solid cherry, perfectly plain. The casings are carved, the one on the right hand at the bottom with white lilies, while the one on the left hand is hemp. If the reader will take the trouble to turn to any little book on the language of flowers, he will no doubt find several very appropriate suggestions in the plants selected for the ornamentation of the doorway. The brackets supporting the lintel are carved with wild parsnips, carefully studied from the plant itself. The front of the lintel is boldly worked in conventional plant forms of Gothic character. The effect here aimed at is a bold projection and a diversity of light and shade.

Our second example, shown in Fig. 5, is a mantel-piece, also in the residence of Mr. Pitman. In this we have an opportunity for showing something of the manner in which Mr. Pitman recommends his scholars to study nature. Figs. 2, 3 and 4 represent details of the mantel, Figs. 2 and 4 being the brackets beneath the mantel shelf. At first sight these seem to be literal copies of nature, and as such satisfy the eye. Upon looking a little further, however, we find they are anything but literal copies of the plants. The artist in making the design has seized upon the essential characteristic features and has expressed them in the simplest possible way in the wood. In Fig. 2 an enlarged view of the bracket shown at the left is presented. It represents succory, or chicory, as it is more properly called. All those things in the plant which do not go toward the general effect desired, have been entirely ignored. The result is that the carving has more of the effect of the plant than an accurate plaster cast could give when placed in the same position. The bracket on the opposite side of the mantel, an enlarged view of which is presented in Fig. 4, is a still better illustration of what we have said above. It represents the wild parsnip. Every leaf is characteristic of the plant, as well as every stem, and yet no one comparing the actual plant with the wooden semblance would fail to see how much had been omitted. In both cases the relief is high, which gives a strong contrast of light and shade. The modeling of the leaves is delicate, and what

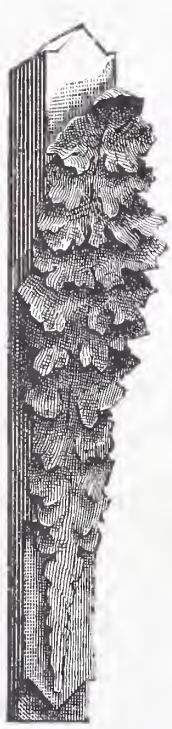


Fig. 3.—Detail of Leaf in the Over Mantel.—Solanum.

the painter would call the half tones, or lighter shadows, have been beautifully managed. In the brackets above the mantel shelf there are four rich leaves of the solanum used for ornament. One of these is shown enlarged in Fig. 3. In all work of this kind it is a habit of the Art School to model the whole design in clay before attempting to cut it in wood. To this no doubt is due in a great measure the admirable disposition of the details and the perfection of the effects which are obtained. We might devote a whole article to contrasting the mantel in Fig. 5 with those which are

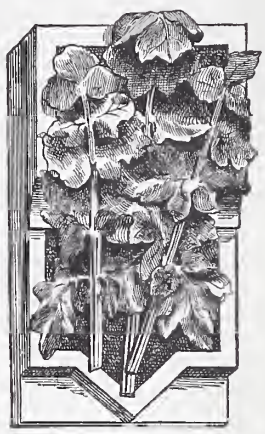


Fig. 4.—Detail of Right Bracket Under Mantel.—Wild Parsnip.

commonly turned out by our cabinet shops, and show that while the quantity of ornament here is vastly greater than is usually found upon a similar object, this has been concentrated. Its richness has been put where it would tell to the best advantage, and not, as we said in regard to the door, spread over the whole surface, to make an uninteresting wilderness of ornamental work.

NOTES AND COMMENTS.

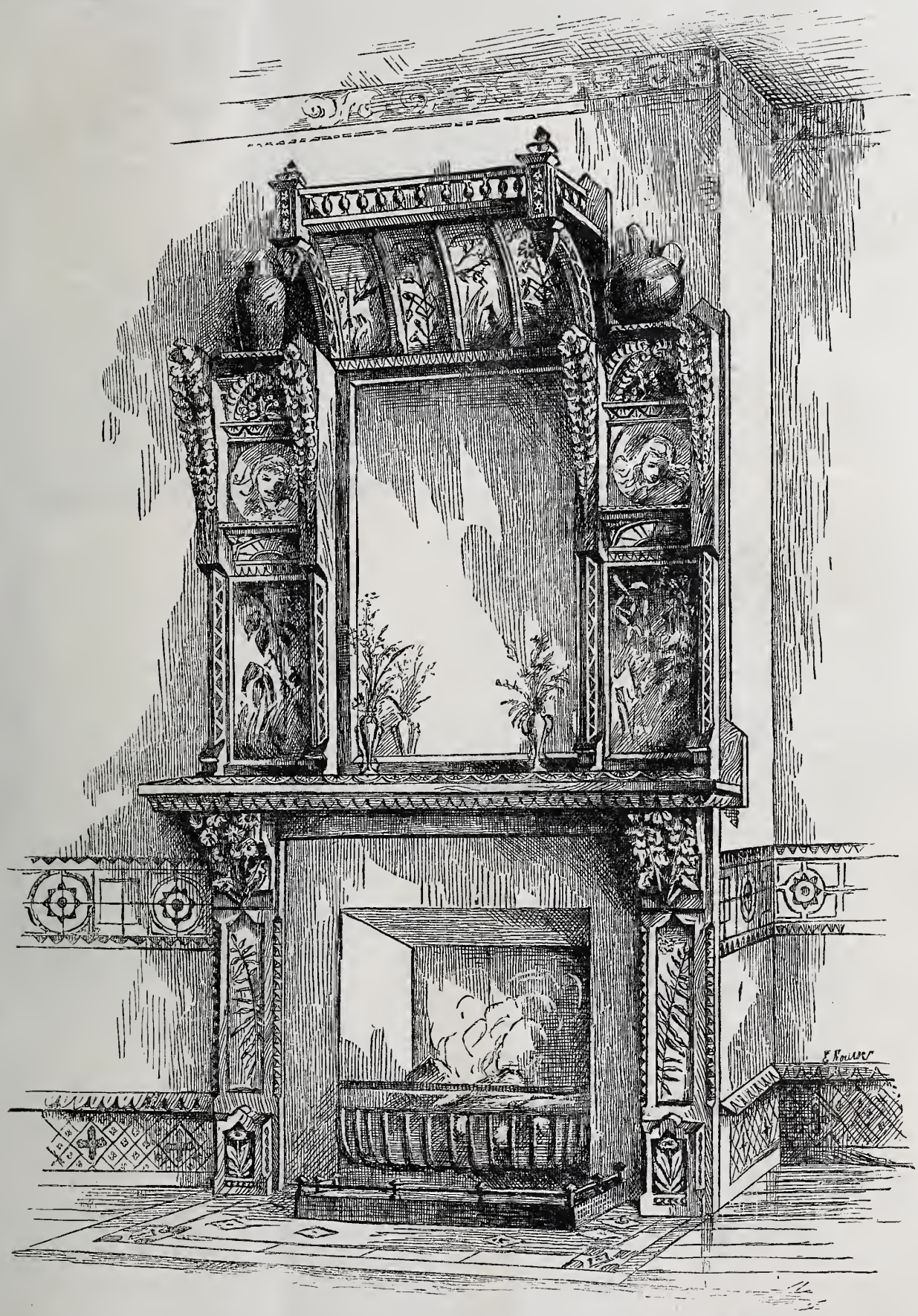
The leading furniture houses in New York are getting up a great many new styles at present. Sideboards that are not built into the walls are light, and incline toward the famous Chippindale patterns. Onyx is a favorite material for the tops of bureaus and for wash-stand slabs. French walnut is much used, and is often elaborately carved. Carving is much used for decoration.

Telegraphic drawing is one of the latest and most interesting products of the science. At the recent Electrical Exposition in Paris, the drawing of an officer of the French Grenadier Guards was transmitted a considerable distance by the ordinary telegraph wires. The original sketch was done in dotted lines with metallic ink. Every time the pointer touched one of these dots the electric current was closed and the mark reproduced at the other end of the wire. In this way the drawing was so exactly copied that the original draughtsman was unable to distinguish between his drawing and the copy thus taken.

The burning of the Ring Theater at Vienna, and the terrible loss of life attending the fire, will revive discussion of theater architecture and the proper means of preventing panics. A great deal of this discussion will be unprofitable. Theoretically, absolute safety is aimed at in such discussions; but practically, chances must be taken in any large body of people. Architects may design theaters with plenty of exits, and with all the known protections against the spreading of fire; but they cannot counteract panics, and they cannot give assurance that those in charge of their appliances will do their duty. The man whose business it was to lower the iron drop curtain at the Ring Theater, might have averted the awful catastrophe had he been at his post.

Every Builder who takes pride in work under his charge gives attention to the minutest details, and the roof with which he covers the building is not one of the least considerations. Tin roofs have been employed in this country for a long term of years, until in some sections they have come to be regarded as the roof *par excellence*. On the other hand, of late there has been a growing distrust in tin roofs, and builders have begun to learn that there are good tin roofs and poor tin roofs. Old builders recognize the fact that the tinwork of the present

day is not by any means equal to what it was fifteen or twenty years ago. The facts of the case are that the quality of tin plate has been allowed by the makers to deteriorate, until the goods commonly sold in the markets are not by any means equal to those which were formerly offered. As might be naturally supposed, the memory of tin roofs as they were has led builders and others to be dissatisfied with work as at present constructed. In response to the demand for first-class tin plates, several importing houses have lately undertaken to bring out goods entirely satisfactory in quality, and which should make the tin roof of the present day equal in quality to that of the past Messrs. N. & G. Taylor Co., of Philadelphia, have given this subject special attention, and are now putting upon the market a plate which is designated as "Old Style," and in its quality in all particulars is intended to be fully equal to the good tin plates of the past. "Old Style" tin plate in its manufacture is said to be redipped or double coated; in other words, it is manufactured in the original way of making tin and roofing plates. Accordingly, it is not open to the objections which prevail against ordinary plates which are made by so-called improved processes, which cheapen the plate at the expense of its quality. We regard this revival of old-style methods in the tin plate trade as quite important, since it takes place in the interest of better plates and better roofs.



Carved Work for Interior Decoration.—Fig. 5.—Mantel-piece in the Residence of Mr. Benn Pitman, Cincinnati, Ohio.

THE CONVENTIONAL AND almost universal white house of New England, with its green blinds, is likely to be done away with for a time by the use of bright colors. About Boston and many of our other large cities the

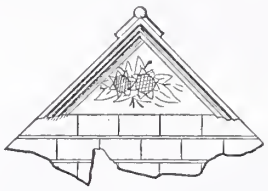
"Gospel of Color" is having its effect, and people are trying various shades and combinations. Thirty years ago there was a vigorous reaction from the white house, but it did not last long. The only colors then used were shades of red, brown and drab—anything but beautiful. Now people, even in practical New England, are finding that beautiful colors pay. The handsome house painted with beautiful tints and producing a lovely effect, is worth more money and sells better than the plain white house. People are beginning to study and enjoy color, and the results of this are seen in their house painting, as well as indoor decoration.

NATURAL FORMS IN geometric arrangement form the basis of all good decorative work. Even with the freest styles of ornament, the influence of geometry may be traced to a large extent. In natural forms we may easily trace the source of our finest ornament. In the best work they are never taken literally, but form the foundation of what is used. By far the greater portion of all ornament is drawn from the vegetable world, and it is worthy of note that the minute plants and flowers usually furnish us with the most valuable suggestions for architectural ornament and for decoration on a large scale; yet while natural forms are the great source from which we must draw our supplies, but few draughtsmen or designers love plants well enough to really study them. They would think it a waste of time to make a careful shaded drawing of a spray of buds or a young sprout of fern, yet such careful studies are of value.

THE BATTLE BETWEEN those who wish all woodwork to be painted and those who would have everything left in its natural state, is by no means over. One thing, however, is pretty well established, that it is by no means desirable to attempt the imitation of natural wood by any graining process. For many purposes, we hold that a painted surface is more desirable than the natural color of the wood. Many persons think that any piece of wood finished in its natural colors is beautiful. This is a mistake, but we may accept it as a general rule, that most of the woods used in finishing our houses are more beautiful in their natural colors than they are when painted. Fashion is strongly in favor of natural woods, and it is fortunate that at the present time they are easily obtainable in almost every form that is wanted for decoration. It is well to remember that a few panels of really fine wood are better than a whole room finished with some common and ugly wood, without any beauty of grain.

IRON BUILDINGS OFTEN burn, yet wooden buildings may be made fire-proof, and frequently are so built. This statement is worth careful thought by all builders. It shows that an incombustible material is not needed for a fire-proof building. A slow-burning building is always better than the so-called iron buildings. One of the means by which wood may be made fire-proof or slow burning, is the exclusion of the air from it, as by sheathing with tin or covering with mortar. For security, we should have no flues or empty connecting spaces in walls, to carry flame where it cannot be reached by water nor its exact position known. Floors are fire-proof where the timbers are incased in mortar and the air spaces closed, or where the floor is solid. A layer of mortar between double floor boards makes a floor nearly fire-proof from below, and in a dwelling quite so from above. Is it not possible to build without making every wall a labyrinth of flues lined with tinder, and giving the utmost protection and draft to a fire that may once start in them? The danger of double wooden walls is reduced one-half when the air spaces are cut off from all connection with each other.

AT A RECENT MEETING of the Institute of British Architects in London, the following sound canons in house building were laid down in the opening address: "All buildings should begin by being well planned; they should be well and soundly built, with elevations meant to bear inspection wherever seen. There should be no sham fronts or false use of materials or deceit as to construction." This advice suits the latitude of New York as well as that of London, if not better. The majority of dwelling houses in this city are built "to sell," and it is safe to say that at least 80 per cent. of them are constructed in the flimsiest manner. We have a small volume of laws and regulations on the subject, but the machinery of their enforcement is so cumbrous, that in more than one instance houses have been erected and have tumbled down before legal process could be executed. The Superintendent of Buildings stated before the Coroner recently that

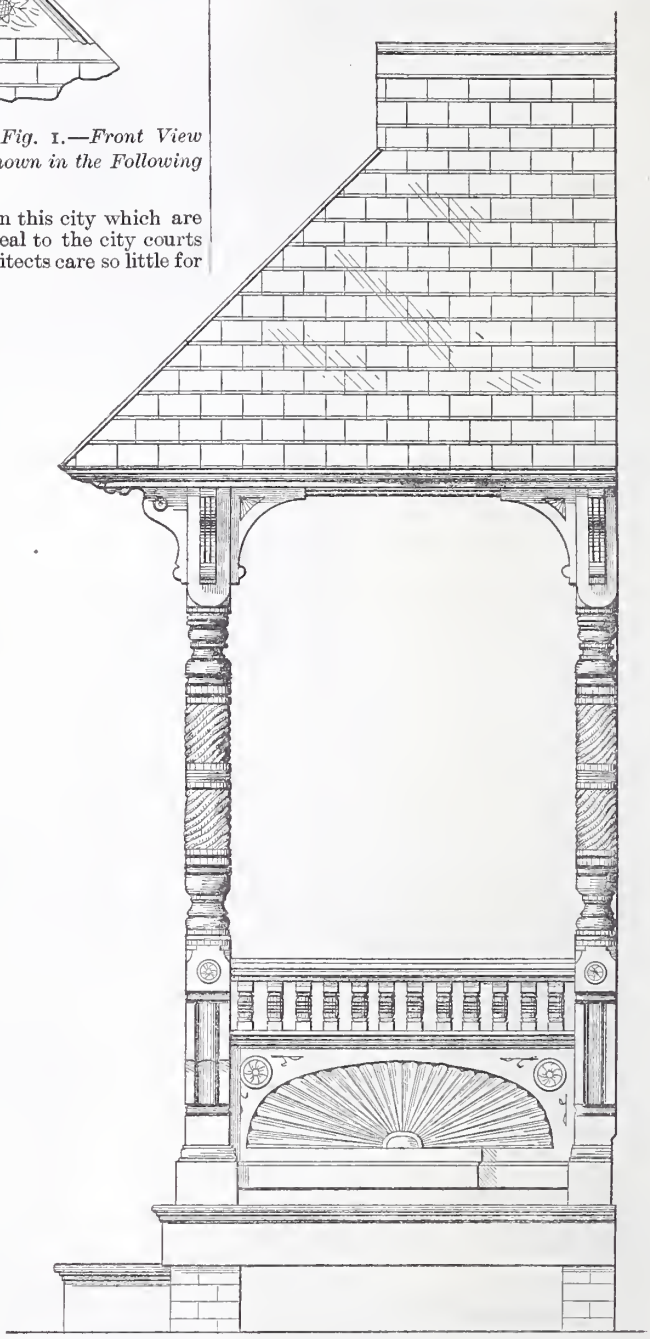


Miscellaneous Details.—Fig. 1.—Front View of Gable of Porch, shown in the Following Cut.

houses are being built in this city which are unsafe, and that an appeal to the city courts would be useless. If architects care so little for their own reputation, and if capitalists are so avaricious and heartless as to build structures of this character, some method of punishing them should be devised. Their responsibility for damages should not cease with the completion or sale of their work.

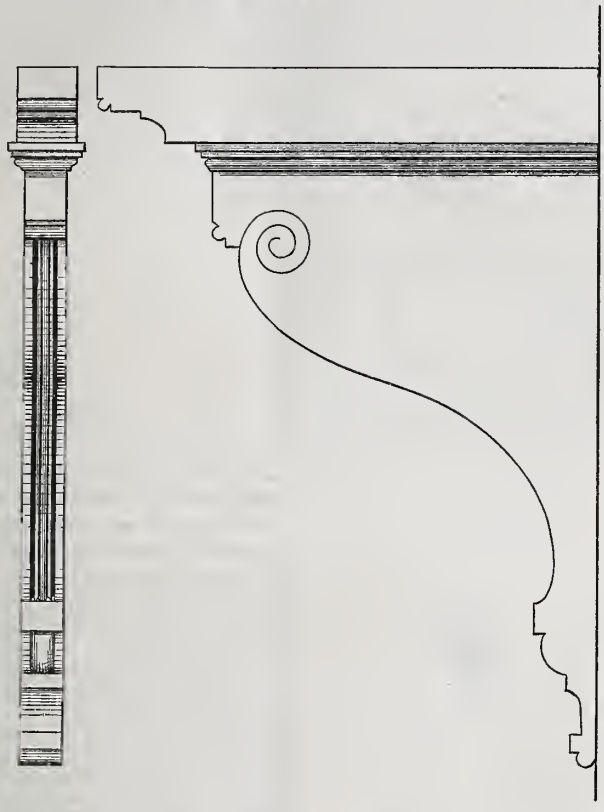
A PAPER WAS READ by Arthur T. Walmisley before the Londou Society of Engineers recently, entitled "Iron Roofs," in which comparisons were drawn between a number of the principal large roofs now in use in Great Britain. The early types of construction resemble the old timber examples, the only alteration being in their section and detail of attachment at the joints. The adoption of roofs of large spans is of comparatively recent date. There is still much difference of opinion as to the advisability of single or multiple spans. The advantage of clear spans are, first, freedom from all intermediate supports, giving facility in laying out space to the greatest advantage. Subsequent alterations in the arrangement of the building are also favored by spans of this kind. They further give a freedom in transfer of traffic, as in the case of railway stations, not to be obtained in simple spans. Another advantage is getting rid of the annoyance of snow lodging in the valleys. Still another important consideration is the more imposing architectural effect of the structure. A mode of covering large spaces sometimes used is to bridge the space to be roofed over with transverse girders, placed at convenient intervals, and carry the covering on these supports. The author favored systems of glazing without putty, and declared that such methods ought to be adopted universally. A glazier's tool should never be used in the construction. In designing a roof, the importance of all points being readily accessible to a painter's brush should be borne in mind. The general use of iron in works of construction renders it desirable to arrive at the best form to adopt in differeut cases consistent with efficiency and economy, and much may be learned by comparing different systems that are in use, both in trussed and arched roofs

WE HAVE RECEIVED from the Cornell University a copy of the *Cornell University Register* for the current year. The architectural course, which is a leading feature in this institution, extends through a term of four years. The courso is so arranged as to give the student instruction in all subjects which he ought to understand in order to enter upon the successful practice of the art. The lectures, which form a feature of the course, are intended to cover the whole ground, practical, scientific, historical and æsthetic. The aim of the department is declared not to be simply to develop the artistic powers of the student, but rather to lay that foundation of knowledge without which there can be no true art. As being of interest to our readers, we will indicate in brief the course of study pursued in this department of the University. During the first year attention is given to geometry and conic sections, French or German, rhetoric, free-haud and linear drawing, projection and tinting, trigonometry, botany, with six lectures on hygiene. The second year is devoted to analytical aud descriptive geometry, to drawiug, French or German, experimental mechanics, composition, elocution, calculus, electricity and magnetism, acoustics and optics, building materials and construction, with lectures on chemistry.



Miscellaneous Details.—Fig. 2.—Side Elevation of Porch.—Scale, ½ Inch to the Foot.

The third year embraces shades, shadows and perspective, strength of materials, experimental mechanics, designing, lithology and determinative mineralogy, acoustics and optics, electricity and magnetism, with lectures on Egyptian, Greek, Roman, Byzantine, Romanesque and Gothic architecture. The fourth year is devoted to geology, designing, stereotomy, with lectures on Renaissance architecture, on modern architecture and on



Miscellaneous Details.—Fig. 3.—Balcony Bracket.—Scale, 1 Inch to the Foot.

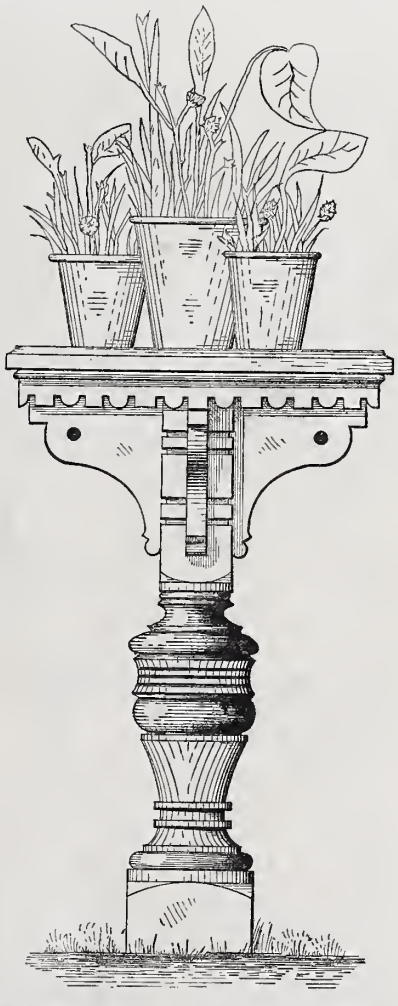
decoration, acoustics, ventilation, warming, professional practice, measuring, contracts, specifications, &c. The course here outlined will undoubtedly appear a formidable undertaking to young men who have in contemplation the architectural profession. For their encouragement, we may say that there are very few men in the profession in this country, comparatively speaking, who have ever mastered a course of study equal to that above named. On the other hand, it should be borne in mind that this course represents, in a measure, the ideal of what it is desirable an architect should understand before commencing practice. Many of the practical men among our readers who have picked up their architectural knowledge in the school of every-day experience, will scan the list of studies above named, wondering what effect such knowledge would have in their daily duties and upon their success in life. In the architectural profession, as in all others, there are men of different degrees of ability and of different qualifications. The race is not always to the swift, and those who understand certain fundamental principles well, and who have but a limited theoretical knowledge, often succeed better than those who are well posted in theory, but are deficient in the practical. The young man who has never seen the interior of a workshop, who has nover gone through any of the practical operations of building, and yet who graduates with honors, will be, in some respects, less able to meet the practical problems in building construction than another young man who has acquired his entire stock of information in practical work and who has no knowledge of many of the studies above named. We make these comments, not in the least disparaging a course of study, but rather to call our readers' attention to the opportunities presented, and to the results likely to be achieved by careful improvement of them. While the practical young man has certain elements of success in him which enables him in many cases to get far ahead of the college-bred young man, and while the latter frequently is so lacking in elements of self-rcliance as to render him of little force or effect in life, all will acknowledge that the best results are to be obtained in combining the best elements of the two. The man who will make a success with limited advantages may, under favorable conditions, be expected to make a greater success if he have all possible opportunities in the way of education and training. It should be the ambition, therefore, of every young man who aims to becomo an architect, and whose early training is in the workshop, to master as much of the course above named as possible. He should not neglect practical training on any account, for the best results, as we have said above, are to be obtained by combining the theoretical with the practical.

The Capitol Building at Columbus, Ohio, is frequently the object of newspaper criticism and jest on account of its peculiar architectural features, and the cheese-box appearance of what by courtesy is termed the dome. Another building in the same city, facing upon Capitol Square, is also an anomaly in architecture. Since it was built by public money, it may be freely criticised without prejudice to private interests. The edifice in question is occupied upon the lower floor by the Post Office, Board of Trade and a reading room. The City Council Chamber, Mayor's Office, &c., are upon the second floor, while over all is a hall for public entertainments. The building is constructed of Berea, or some similar quality of sandstone, which material has been used unstintedly. A number of pseudo-Gothic features abound in the exterior design, and the building is capped with a mansard roof without any marked gutter or cornice projection at the base. Altogether it is about as handsome as an unhewn block of stone or a clod of clay. Spacious halls within the building are dark at mid-day. A pretentious stairway, which occupies a considerable portion of the three floors, is arranged so as to be an admirable trap and pitfall in case of a panic. Its graceful curves and accommodating landings, with branch-flights, occurring as they do without regard to the columns and piers which support the roof, are enough to trip a cool-headed man walking alone, to say nothing of a crowd pouring down them. We are not surprised to learn that the author of this design sought fresh fields and pastures green for the pursuit of his profession (?) before the building was fairly completed.

Pittsburgh, on account of its smoky atmosphere, offers as few inducements for architectural display, perhaps, as any city in the Union. Notwithstanding this fact, its street architecture of late years compares favorably with that of other places. Some of the new buildings recently put up, and some of the old which have been improved by the addition of fronts of modern design, go a great way toward relieving the city of its commonplace character. The introduction of fronts with showrooms and display windows upon the second floor has resulted in brightening up certain business blocks, which otherwise were quite dull and uninteresting. Pittsburgh delights in bright colors in dress goods and house furnishings. The merchandise of dealers displayed in the open fronts now becoming popular, is giving the citizens an opportunity of studying styles and contrasts heretofore impossible. The city at present wears a more cheerful face, so to speak, by reason of these changes, than ever before.

Miscellaneous Details.

Continuing our series of details of work of a character that is constantly arising in the practice of carpenters, builders, planing-mill managers and others, we show this month a neat porch, suitable for erection in connection with almost any house designed in the present fashionable styles of architecture. The posts present a pleasing combination of turned and square work, with enough of carving in the spiral flutes to give life and spirit to the design. Dwarf balusters are employed in the railing, the panel below being worked in the time-honored fan-like ornament, now quite



Miscellaneous Details.—Fig. 4.—Flower Stand.—Scale, 1 Inch to the Foot.

popular. The brackets in the cornice are simple in their parts, but quite effective. The roof is managed so as to present the small gable to the front, shown in Fig. 1, which breaks up the otherwise plain surfaces. A balcony bracket is shown in Fig. 3. The sido is entirely plain, except the incised scroll, which grows naturally out of the profile of the front. The face of the brackct is molded. Fig. 4 represents a flower stand suitable for use in almost every yard. The pedestal is of turned work, with a square plinth. Four plain brackets support the shelf.

Practical Stair Building.—XVII.

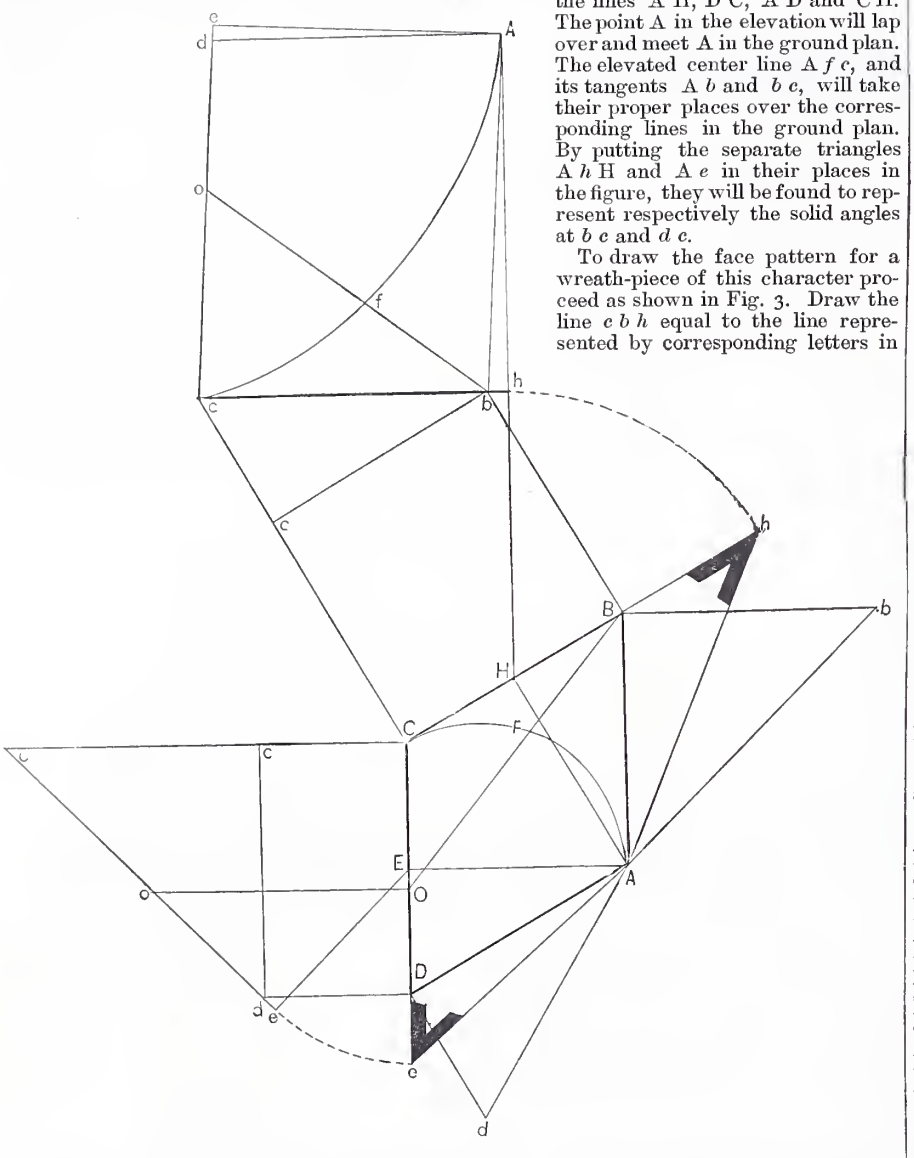
WREATH-PIECES WHICH PASS FROM ONE RAKE TO ANOTHER OF DIFFERENT INCLINATION OVER GROUND PLANS THAT ARE MORE THAN QUARTER CIRCLES.

Let the curve A C in Fig. 1 be a ground line which is more than a quarter circle. A B and B C are its tangents. It is required to produce an elevated center line over A C, having its tangents over A B and B C, of unequal inclination. Complete the parallelogram A D C B. Draw the triangle A *b* B, showing the inclination of the tangent A *b* over A B. Draw the rectangle C *c b* B equal in hight to B *b* of the triangle. Draw the triangle *b c c*, showing the proposed rise of the tangent *b c* over B C. Draw A H at right angles with B C. Produce *c b* in the direction of *h* indefinitely. From the point H in the line C B, draw H *h* A at right angles with *c h*, cutting the latter line in the point *h*. Produce C B in the direction of *h* indefinitely. From H as center, with radius H *h*, describe the arc *h* H, thus establishing the point *h* in the line C B extended. Connect *h* and A. On the line H *h* A make *h* A equal to the bevel line *h* A. Connect A and *b*. Complete the parallelogram A *d c b*. From the point A in the parallelogram, draw A *e* at right angles with *c d* extended, cutting that line in the point *e*.

Draw the triangle A *d* D in the lower part of the figure equal to *b c c*. Draw the rectangle D *d c* C equal in hight to D *d*. Draw the triangle *d c c* equal to A *d* D. Draw the line O *o* parallel with C *c*, in length equal to B *b*. Connect O and B. Take the distance *c o* and set it off from *c* on the line *c e*. Connect the point *o* thus established with *b*. Make *b f* equal to B F of the plan, and through *f* draw the elevated curve line A *f c*, as shown. Draw A E perpendicular to D C. Produce the rake line *c d* in the direction of *e*. Draw E *e* at right angles to *c d* produced, meeting the latter line in the point *e*. Produce C D indefinitely in the direction of *e*. From E as center, with E *e* as radius, describe the arc *e* E, thus establishing the point *e* in C D extended. Connect *e* and A.

This diagram, like others of the same character which we have explained, may be proven by folding. Make the triangles A *h* H and A *e* E of separate pieces of cardboard. Fold up the other portions of the figure, scoring on the lines A H, D C, A D and C H. The point A in the elevation will lap over and meet A in the ground plan. The elevated center line A *f c*, and its tangents A *b* and *b c*, will take their proper places over the corresponding lines in the ground plan. By putting the separate triangles A *h* H and A *e* in their places in the figure, they will be found to represent respectively the solid angles at *b c* and *d c*.

To draw the face pattern for a wreath-piece of this character proceed as shown in Fig. 3. Draw the line *c b h* equal to the line represented by corresponding letters in Fig. 1. At right angles with *c h* draw *h* A equal to the bevel line *h* A. Draw A *b* parallel with A *b*. Draw *c o* equal to *c o* of Fig. 1. Draw *o d*. Make *b f* equal to B F. At A and *c* make the pattern about one-quarter wider than the rail, and at *f* about one-eighth wider than the rail. With governing points thus determined, draw the inside and outside lines of the pattern as indicated in the figure. The bevel at *h* place at the joint *c*. The bevel at *e* place at the joint A.



Wreath-pieces which Pass from One Rake to Another of Different Inclination over Ground Plans that are more than Quarter Circles.—Fig. 1.—General Method of Describing the Elevated Center Line.

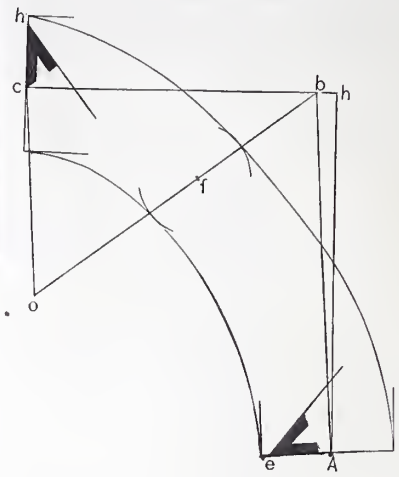


Fig. 3.—Laying Out the Pattern.

The corresponding problems are those of

WREATH-PIECES WHICH PASS FROM ONE RAKE TO ANOTHER OF DIFFERENT INCLINATION, OVER GROUND PLANS THAT ARE MORE THAN QUARTER ELLIPSES.

The manner of proceeding with problems of this kind is almost identical with what we have just described. Corresponding letters represent corresponding parts in the two sets of diagrams herewith presented. The usual abbreviated rule which we have been explaining from month to month in connection with the long method, we have omitted in the case last considered, but will describe it in full in connection with the elliptical ground plan. In the last problem certain points coincided with each other—H, which is the common terminus of the lines C H and *h h*, and E, where the lines A E and *e e* meet each other.

Referring now to Fig. 5, from the ground line, with its tangents A B and B C, it is required to produce a rail pattern having its tangents over A B and B C of unequal inclination. Draw the triangle A *b* B, showing the rake of the tangent A *b* over A B. Draw the triangle B *c c*, showing the proposed rake of the tangent over B C. Draw A H at right angles with B C and C E at right angles with A B. Consider A B as a level line, and with the hight B *b*, draw through *b* a line on the same pitch as the tangent over B C, thus making the angle B *b h* equal to the angle C *c d*. Transfer the distance B H from the line B C on to the line B A. Draw H *h* at right angles with *b h*. In this connection the reader will notice how this line H *h* corresponds with A *h* of Fig. 4. Produce C B to *h*, making H *h* equal to H *h*. Draw *h* A. Consider B C as a level line, and with the hight C *c*, draw through *c* a line of the same pitch as A *b*, making the angle C *c e* equal to the angle B *b* A. From C take the distance C E, equal to E B on the line A B. Draw E *e* at right angles with

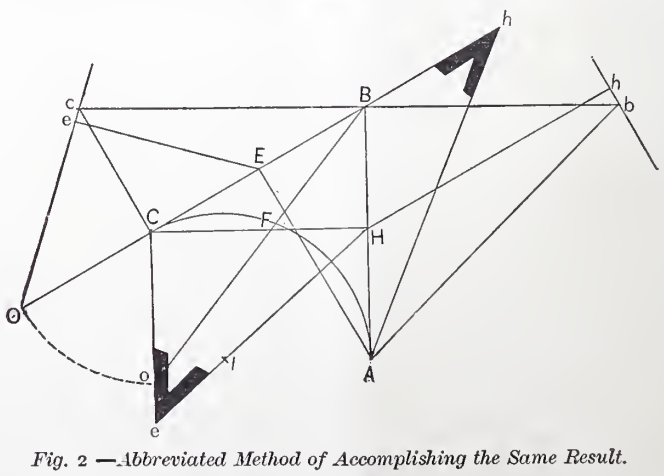
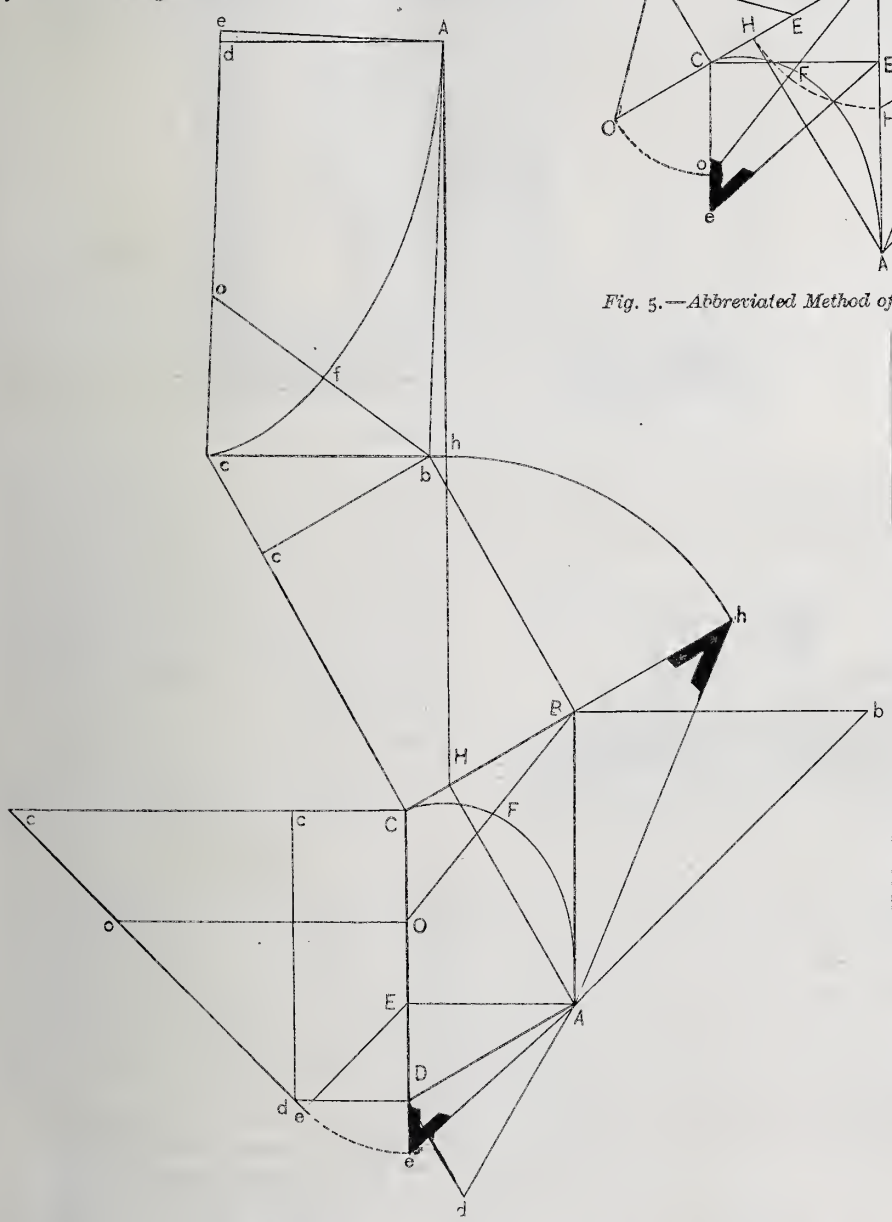


Fig. 2 —Abbreviated Method of Accomplishing the Same Result.

c e. The correspondence between this line E and the line represented by the same letters in Fig. 4, will also be noticed. Draw C *e* parallel with A B equal to E *e*. Draw *e* E. Produce B C and *c e* to meet at O. Draw the arc O *o*. Draw the measuring line O B.

With the diagram thus constructed, the pattern is laid off as follows: In Fig. 4, draw the line *c b h*, making *c b* equal to *c* B, and *b h* equal to *c e*. At right angles with *c h* draw *h* A equal to the bevel line *h* A. Draw A *b*. Draw *c o* equal to *c o*, and parallel with A *b*. Draw *o b*. Make *b f* equal to B F. At A and *c* make the pattern about one-fourth wider than the rail, and at *f* about one-eighth wider than the rail.



Wreath-pieces which Pass from One Rake to Another of Different Inclination over Ground Plans that are more than Quarter Ellipses.—Fig. 4.—General Method of Describing the Elevated Center Line, &c.

With the governing points thus determined, draw the inside and outside lines of the pattern as shown.

NEW PUBLICATIONS.

THE PHOTOGRAPHIC AMATEUR. By J. Traill Taylor. Published by the Scovill Manufacturing Co. Price, 50 cents.

This work contains a series of lessons in familiar style for those who desire to become practically acquainted with the useful and fascinating art of photography. The first chapter describes preliminary arrangements, operating room, wet and dry-plate photographing, focussing, &c. The following chapters give practical directions of various operations incident to the making of a picture. The work is intended as a practical guide to the use of an amateur photographic outfit which the Scovill Manufacturing Co. are selling. We do not know what demand there may be in the market for apparatus of this kind, but since the work of photographing has been greatly simplified and brought down to the understanding of mere novices, we should suppose a very considerable demand would exist. It strikes us that the ability to photograph a building would in many cases be of great advantage to an architect. With apparatus costing from $10 to $18 complete, and capable of making pictures 4 x 5 inches to 5 x 8 inches, the architect would have in many instances a convenient means of taking to his office views of buildings which would be of great service to him. These are mere suggestions concerning the use to which apparatus of this kind may be applied, and afford reasons why the little book we have mentioned should be read.

COMMERCIAL PRECEDENTS. By Charles Putzel and H. A. Bähr. Published by the American Publishing Co. Bound in cloth. Price, $3.

This work is a compilation of replies and decisions on commercial matters selected from the columns of the New York *Journal of Commerce*, and is a convenient work of reference for business men generally. We have not space to enter into a criticism of the book, but will say that its general arrangement and the character of its contents recommend it to general perusal. While we should take exception to some of the conclusions reached, in the main the book is accurate and contains much information. An alphabetically-arranged table of contents precedes the work, while it is supplemented by a very complete index. The subjects treated are arranged under general heads, among which may be mentioned assignments, banks, bills of exchange, bookkeeping, brokerage, commercial terms, corporations, employer and employee, executions, freight, legatees, insurance, judgments and executions, mortgages, taxation, trade-marks, wills, &c.

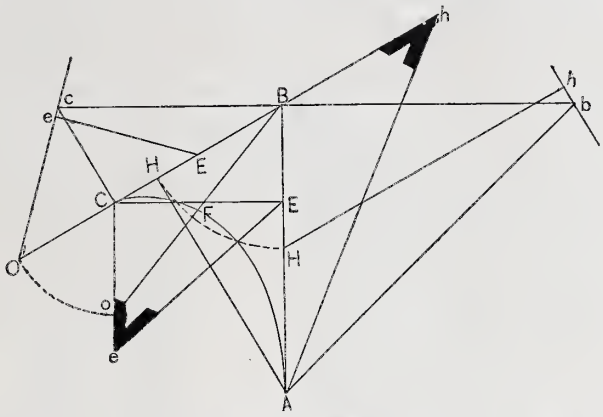


Fig. 5.—Abbreviated Method of Accomplishing the Same Result.

SPON'S ENGINEERS' TABLES. By J. T. Hurst. Fourth edition; 1¾ by 2⅝ inches; 140 pages; in cloth case. Price, 60 cents.

This little work consists of a series of tables and memoranda for engineeers, covering in a very small space much of the ground usually found in the larger engineering handbooks. The number of tables and the amount of information is very much greater than it would appear possible to place in so small a space. Among the leading subjects we have excavators' memoranda, bricklayers' memoranda and memoranda for slaters, carpenters and plasterers. There is a chapter devoted to the smith and founder; another one devoted to the weight of sheet lead, lead pipes, zinc and zinc nails, &c. Mensuration, hights of the barometer, dew points, girders and hydraulics also have considerable space each. There is also a chapter on weights and measures. The pocket-book is inclosed in a small cloth case, and, we think, is the smallest engineering pocket-book ever issued. The tables and data are all computed for use in England.

THE PREPARATION AND USE OF CEMENTS AND GLUE. By John Phin. Fifty-eight pages. Paper covers. Price, 25 cents.

This little pamphlet is the first of a series entitled "Work Manuals," which are announced to embrace a great variety of the "arts of every-day life." It contains no less than 177 recipes. One of the features of these recipes is their practical character. They are such as are in the market or in special use at the present day, and, so far as

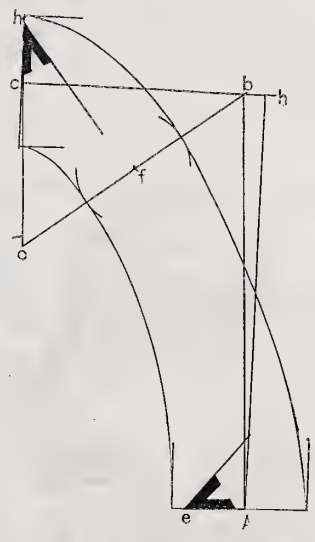


Fig. 6.—Describing the Pattern.

we know, are the best for their respective classes. Larger lists might be made, but they would include a vast amount of rubbish. One can scarcely take up a dictionary of recipes without finding certain directions given for making various cements, or glues, or pastes, which have come down to us from the last century, and which, at the present day, can hardly be made, either on account of the use of articles not found in the market or because the ingredients are described by names not at present used in the stores.

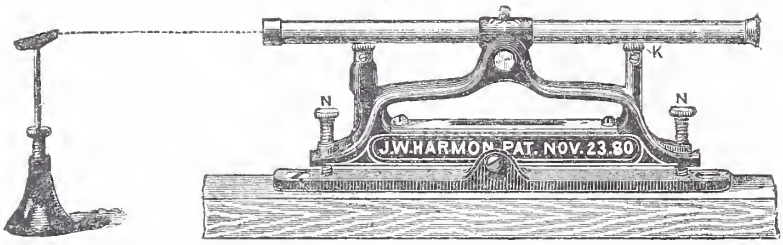
DRAWINGS, SPECIFICATIONS AND BILL OF MATERIALS FOR A $1000 COTTAGE. By F. T. Camp, Architect. Price, $2.

In an effort to meet the constant demand for drawings and specifications of inexpensive houses, the author of these plans has prepared a set of six plates, containing all that is ordinarily considered necessary in the hands of a practical builder for erecting a building. In style the house as nearly approaches what is commonly known as the Swiss as anything with which it can be compared. An indication of outside timbering forms one of the prominent features of the design. Two of the plates contain elevations and a section of the house. The third, fourth and fifth contain the plans, while the sixth plate is devoted to details. The specifications and bill of material appear upon the sheets above and below the drawings. These plates are printed by a photographic process, and are fair reproductions of the author's original.

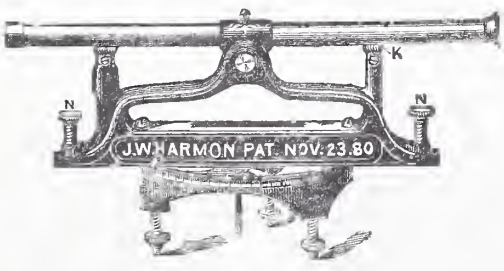
NOVELTIES.

TELESCOPIC PLUMB AND LEVEL.

Figs. 1 and 2 represent a new instrument manufactured by J. W. Harmon, of No. 65 Haverhill street, Boston, which is of special interest to builders, and all who have occasion to do any work like leveling or running lines. It is called the "Telescopic Plumb and Level," and is adapted for use in various connections. Fig. 1 shows the instrument mounted upon a straight edge, by means of a plate provided for the purpose, and used with an adjustable sight gauge. By removing a single screw, shown in the center of the engraving, the instrument may be placed upon a graduated stand, as shown in Fig. 2, in which position it is adapted for use in running lines at any required angle. The special features of the device are simplicity of parts, thorough construction, convenience of adjustment, and adaptability to the purpose for which it is intended. By it many of the operations for which surveyors and engineers use more expensive instruments may be performed with accuracy. A spirit-level is provided in the center under the telescope, and also in the standard, supporting the front end of the tube.



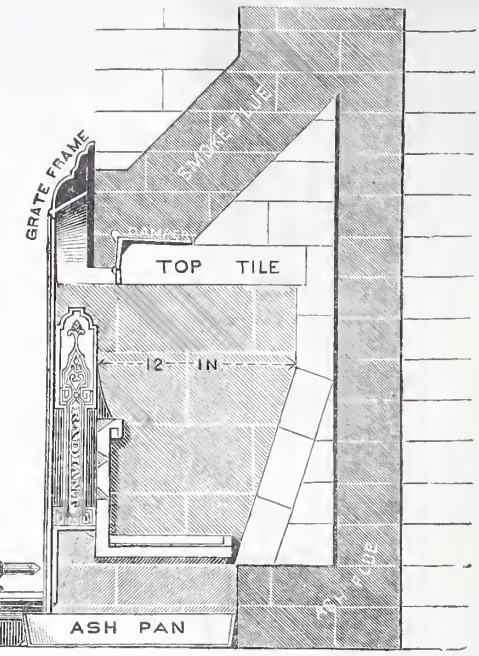
Novelties.—Fig. 1.—Telescopic Plumb and Level Mounted on a Straight Edge.



Novelties.—Fig. 2.—Telescopic Plumb and Level Mounted on a Graduated Stand.

THE "RADIANT" GRATE.

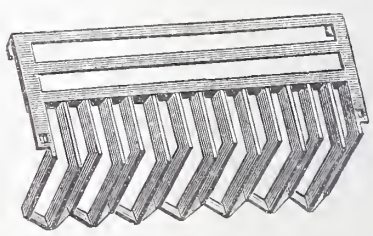
Messrs. Innes, Magill & Co., of Cincinnati, Ohio, are manufacturing a grate which, although well introduced in that city and vicinity, possesses some features which will doubtless be considered novelties by many of our readers. Fig. 3 of the illustrations shows a sectional view of the grate as set with a round-top front. Preferably a square-top front is used, but the patterns are such that the parts can be used in whatever connection is most desirable. Fig. 4 shows a general view of the grate basket, which also possesses features of interest. By examination of the sectional view, it will be seen that direct ascent of the fire is cut off by the top tile, which is placed horizontally. By this means the flames are driven forward, and find their course up the chimney through an opening which is controlled by a damper. By this arrangement of parts the heat is concentrated and thrown directly into the room, resulting, as the manufacturers claim, in a great saving, as compared with other and competing devices. The grate basket, as described in the manufacturers' circular, is made with a double-bar corrugated or fluted bottom, which forms air passages or ducts under the fuel, thereby facilitating shaking the ashes from the fire. Another feature which is of interest is the management of the ash screen, which is hinged to the basket, and which is so shaped that it does not need removing when in use, and it most effectually hides dirt and ashes from view. The manufacturers have given special attention, in the construction of this grate, to the matter of packing away the parts in summer time, and of affording convenient means for stopping the flue against the descent of soot. This is especially necessary where soft coal is used for fuel, which is the case in Cincinnati. By removing the damper, and folding a thin piece of cardboard or a heavy piece of paper in, and closing it, a valve for summer use is provided, which avoids the nuisance of stuffing the flue with old rags or papers to keep the soot from soiling carpets and the like. The jamb plates are so set as to leave an air space in the wall, thereby avoiding the burning and defacing of the enamel, as is the case in grates of ordinary construction. The grate basket hangs on the jamb plates 2½ inches in from the opening of the grate frame, effectually preventing the annoyance of smoke occasioned by side draughts. This construction also enables the summer front to be put on without removing the basket. The ash-pan and the ash-screen pack inside of the grate, thus keeping them convenient for use when required, and without the possibility of having them mislaid. The name given to this apparatus is the "Radiant" grate, and the manufacturers claim that it stands far in advance of other grates in point of excellence, simplicity, efficiency, economy and general appearance. They lay special stress upon its heating qualities.



Novelties.—Fig. 3.—Sectional View of the Radiant Grate.

PERSPECTIVE LINEAD.

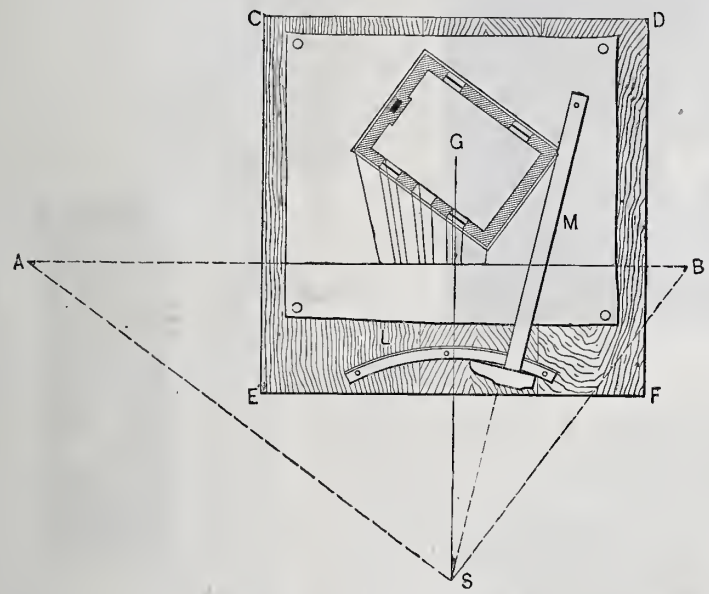
Figs. 5 and 6 illustrate what is called the "Dexter Perspective Linead." The instrument consists of a T square, one edge of the blade of which is directly in the center of the head. A number of curves, some of which are shown in the engraving, accompany it, and are employed upon the drawing board as shown for determining the direction of the lines in the perspective. The utility of this apparatus is evident, when it is considered that the station, or point of sight, in perspective drawings frequently occurs at such a distance from the geometrical plan that a long board would be required if the point itself were actually used in drawing the lines. By means of curves the necessity of using the actual point is obviated. With each instrument nine curves of different radii are furnished, thus adapting it for use under almost all circumstances which may arise. The T square being so adjusted that one edge of the blade is in the center of the head, that edge, when applied to a curve, will radiate to the center from which it was described. With this brief description we think our readers will appreciate the convenience of the device for facilitating the production of perspective drawings. The instrument is the invention of Mr. J. B. Shengle, of No. 20 Newton street, Cleveland, Ohio, who also manufactures and sells the same. The inventor claims that by using the Dexter Linead enough time is saved in making two ordinary perspective drawings to pay the cost of the instrument.



Novelties.—Fig. 4.—Basket of the Radiant Grate.

IMPROVED BLOCK SHAVE PLANE.

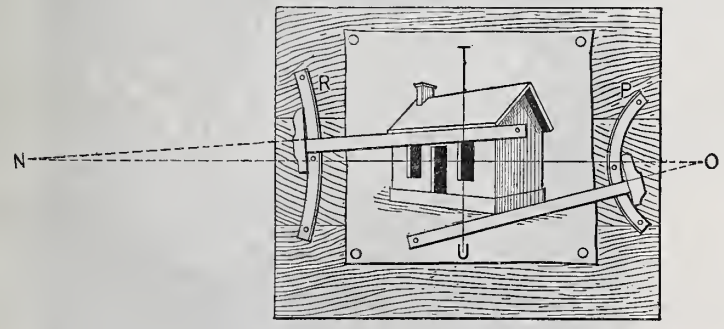
Fig. 7 represents a block shave plano now being introduced to the wood-working trade by Mr. James Y. Simons, of No. 178 Washington street, Boston, Mass. This article was originally made for use in leather-working establishments, but its utility for wood-working purposes was soon discovered, and the necessary changes in form to adapt it for use were made, and it is now being introduced under the above name. It is a very useful and convenient tool for many purposes for building and shopwork. One of the uses to which it is put is dressing floors. It takes the place of a jack plane, a smoothing plane and a block plane in one instrument. It may also be used by shippers for removing old addresses or marks, and for this purpose is said to be far superior to the ordinary scrapers now in use. In the household it fills the place of other tools, and is a valuable article for easing sagged doors, window sashes, &c. It also finds a place in wagon shops.



Novelties.—Fig. 5.—Perspective Lineal.—Application of the Instrument to the Plan.

Maple for Cabinet Work.

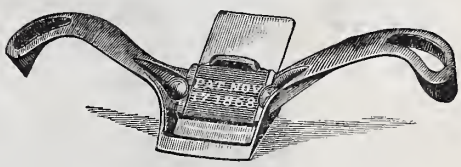
Almost every one knows something about maples, but very few, even of experienced cabinet makers and carpenters, ever think of these woods as being available for anything but fire-wood, or, perhaps, for the making of some delicate box where white holly is not available. The white maple (*acer rubrum*) is one of the whitest woods growing in this country, only exceeded in that respect by one or two. It is, however, on account of its extreme softness and general lack of strength, practically valueless. The sugar maple (*acer saccharinum*) is one of the most useful trees we have. While it is very cheap in our markets, we cannot consider that it is a valueless tree, this low price of the timber resulting from the fact that it is not fashionable, and has not been used to any extent for anything save millwork and rough carpentry. Its grain is very fine, and, in hardness and general adaptability for fine carving and cabinet-work, stands next to boxwood. Beech somewhat exceeds it in the fineness of grain, but is not nearly so beautiful. The great strength of maple renders it valuable in all kinds of delicate work, preventing it from being readily broken, and, at the same time, allowing a slenderness of construction quite inconsistent with any weaker material. Almost all maple has in its structure a certain waviness which causes it, when polished, to reflect light and to appear almost dapple. Other varieties are the well-known bird's-eye maple, which, thirty or forty years ago, was a very popular wood for certain kinds of cabinet work. Many persons suppose that that the bird's-eye maple is a separate or peculiar tree, differing from other maples. This is a mistake. Most of the rock maples have a tendency to form little hillocks beneath the bark, and each layer of wood during growth is evenly covered over with these projections, which do not grow larger, but retain their original size. The result of this is that when a slice is taken through one of these little lumps or pits, we find that the grain of the wood is bent up or down in a circle and, of course, reflects the light differently from that part which is horizontal. In what are called bird's-eye maple trees, these little hillocks or pits in the bark are disposed closely together and regularly throughout the tree. In opening such a tree, when the cut is parallel to the bark, we have a board showing the bird's-eye maple markings. If, however, the cut is made radially it passes through the hillocks vertically, and, as they extend from the heart to the bark of the tree, we have something which produces upon the wood the effect of a wave. When a log is sawn so as to show the eyes, it is known as bird's-eye maple, and when cut radially, so as to make the waves most prominent, it is called waved maple, or, in some places, curly maple. The wave pattern will almost always be found in any bird's-eye board by looking at the edge, and *vice versa*. Maple has one advantage which has been improved very little by cabinet makers, and that is its susceptibility to staining processes. The wood is capable not only of being ebonized, but of taking several very beautiful colors. We have seen bird's-eye maple for small work stained to a very beautiful drab, which harmonizes well with both furniture and decorations. The supply of this wood is abundant, and, fortunately, can be obtained in large size. Hitherto its principal value has been for fire-wood.



Novelties.—Fig. 6.—Perspective Lineal.—Use of the Instrument in Delineating the Object.

Influence of Home Decoration.—The increasing influence of fashion in furniture and interior decoration is one of the strongest indications of the cultivation of artistic taste in this country. It is an effect which proves and justifies the cause. It may be, and doubtless is, carried too far in some cases, and becomes more of a "rage" extended by infection or imitation, than a simple fashion imposed by æsthetic cultivation. In such cases it has a great run for a while, and then dies out, leaving only the dregs of the excitement to remind its victims of their folly; but there still linger with them the spirit aroused by their efforts to improve, and the better taste in such matters that naturally grows out of the practice and study of art. All artistic effort educates, and when the school is the home, there cannot fail to be much good wrought out of even a craze. To improve our taste in furniture and in the general decoration of our homes, is to improve the surroundings of the young, and even to strive after such improvement is to set an example calculated to inspire the youthful mind with loftier aspirations, and incite it to higher and nobler achievements. Thus the dado and the plaque, and the Limoges ware, and the quaint Japanese styles, and the Queen Anne, Renaissance and other styles in furniture, all have their uses, and, operating within the sphere of domestic and social life, they bring their influence to bear where it is most likely to make a profound impression.

Compound for Removing Varnish, Paint, &c.—Place in a suitable wooden trough 15 gallons of water, and add thereto 10 pecks of unslaked lime; let it remain until the lime is well slaked; then add 15 gallons more water, so as to produce a milk of lime, to which, when cool, is to be added from 30 to 35 pounds weight of treacle. These ingredients must be well stirred, so as to become thoroughly mixed, and 70 gallons more of water added. The liquid may then be drawn of and strained into a copper or boiler. Ten stones of flour (mixed in from 35 to 40 gallons of water) are to be added to the lime water in the copper, when the whole mass must be well stirred for about half an hour, and then boiled or heated to about 200 degrees for some 20 minutes, gradually adding 4½ cwt. of common carbonate of soda, and taking care to keep the mixture continually stirred during the boiling. The liquor is then drawn off and strained, and, when cool, a gallon of carbolic acid is added, for the purpose of preventing the preparation from undergoing decomposition. This compound may be used either for cleaning paint (for which purpose it must be diluted), or for softening paint, varnish or japan, preparatory to removing the same from any wooden or other surface, and for removing oxide or dirt from the surface of metals. This preparation may be made up for the market in either a liquid, semi-liquid or in a solid form, the latter being obtained by evaporation.



Novelties.—Fig. 7.—Improved Block Shave Plane.

Snowsheds are a feature of Western mountain railroads. Chas. Crocker, Vice-President of the Central Pacific road, first suggested them. Some have steep and some flat roofs, and the cost ranges from $6000 to $12,000 per mile. Snow accumulates on them in places to the depth of 50 feet. In a shed 10 miles long a locomotive, with tank, &c., is kept, ready to flood any portion in which a fire may break out. Automatic electric fire alarms are provided.

Ready-Made Marquetries.

The term "marquetry" is derived from a French word which means to checker or to inlay. In its meaning it has close rolationship to our English woodwork. Its application is in the sense of describing work inlaid with different pieces of various colored woods, shells, ivories, etc. In many cases the groundwork is dark in color, and the design of scrolls or geometric patterns is of one or more lighter shades of wood. This order is also reversed. The usual plan of preparing marquetries is to lay two or four pieces together and cut the design through the several parts. Unlike fretwork, there is no material lost. Two sets of patterns are obtained. If

Ready-Made Marquetries.—Fig. 1.—Trumpet and Violin Pattern, 10¼ by 17¾ Inches.

a light and a dark wood are used, the scroll cut from the dark wood is inserted in the body of the light wood, and *vice versa*. In cutting a table top, for instance, two patterns are obtained, one the reverse of the other, or, to speak in other terms, one is negative and the other positive. The base or foundation of marquetry work is ordinarily a wood much cheaper than that of which the outside finish is made. The marquetry is in many cases executed in veneers. After the patterns have been made up they are applied to the base of cheaper wood, the same as veneers.

From this brief description of the ordinary method of making marquetry patterns, it is

Fig. 2.—Upright Panel, 4¾ by 28½ Inches.

evident that fine tools and a considerable degree of skill upon the part of the operator are required. Marquetries have been gratly prized in all ages, and there are very few mechanics who take an interest in their work who have not done more or less in this direction, practically or as amateurs. In handling veneers cracks frequently occur, and the common direction given, especially to beginners, is to paste a piece of cloth across the end of the veneer to prevent cracking, and in the event of a crack having occurred, to back it with a piece of paper neatly glued in position. It was, perhaps, from remedies of this kind that the inventor of the marquetries which are represented upon this and the following pages derived the ideas which led to the results ho has sinco achieved. However that may bo, the ready-made marquetries to which we shall call attention aro simply thin veneers backed by strong paper. Patent papered veneers have been before the public for a considerable length of time, and aro, no doubt, somewhat familiar to our readers. They are cut from natural wood and are much thinner than the ordinary veneors of commerce. In many cases they measure from 1-90th to 1-175th of an inch in thickness. They are backed with strong manila paper, which renders them convenient for handling and easy of application. The marquetries are simply veneers of white holly, upon which, by a peculiar process, the patterns or designs are printed or painted. Referring to the first of our illustrations, the surface of the veneer, as first prepared, is white. The body of the pattern is stained into the veneer, or, to express it differently, the groundwork is ebonized, leaving the forms of the instruments and the branches in white. If it be desired to imitate other colors of wood, the design is subsequently treated by means of properly prepared colors applied with a brush. There is opportunity for a fine display of artistic talent in coloring patterns of this description. From what we have said, it will be understood that in ready-made marquetries the sawing is done away with, being superseded by marking in transparent colors on one whole piece, and dyeing and shading to suit the design. By this means, a flexible and

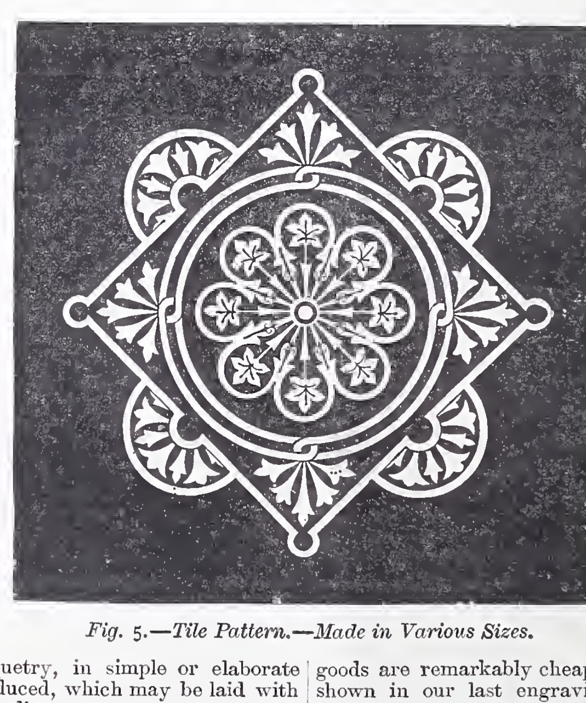


Fig. 5.—Tile Pattern.—Made in Various Sizes.

durable marquetry, in simple or elaborate design, is produced, which may be laid with a caul in the ordinary manner, or rubbed on. After the marquetry is in position, it may be French polished or varnished to suit circumstances. From specimens which we have seen, it is evident that work produced in this manner stands all changes of climate, and without working up and off of the inlays which frequently attends the ordinary marquetries. Very littlo difficulty is experienced in laying either the veneers to which we have alluded above or the marquetries for, so far as concerns this process, they are alike. In laying with glue, the veneers are slightly

Fig. 3.—Border, 5 Inches Wide.

dampened and placed with the paper side to the glue. In laying ordinary veneers, it is necessary that tho surface should be true, because the veneers are so thin than any inequalities will appear in the finished work.

Referring to the engravings, Fig. 1 represents a trumpet and violin pattern, 17¾ inches long by 10¼ inches wide. Following this is a neat design suitable for an upright panel. Fig. 3 represents a border, and Fig. 4 a buttercup pattern, appropriate in many

Fig. 4.—Buttercup, 6 by 12 Inches.

places. Fig. 5 is a tile pattern, the size of the piece being 9 inches square. The next figure is a scroll pattern of conventionalized forms, suitable for an upright panels, and is made 10 by 25 inches. Two borders follow. The last design presented is a table top 18 inches in diameter. In calling attention to these goods, in which we feel sure many of our readers will be interested because of the varied application that may be made of them, our notice would not be complete if we did not indicate in some measure their cost. The goods are remarkably cheap. The table top shown in our last engraving, 18 inches in diameter, in white holly, costs only 51 cents, while, handsomely executed in colors, the price is $1.65. Other designs are proportionately cheap.

The uses to which work of this kind can be put are so various that there would be no especial advantage in our attempting to enu-

merate them. It is quite extensively employed by a number of piano and organ manufacturing companies in the embellishment of their instruments. It is used to a considerable extent in furniture and cabinet work. For our readers it will have special interest in fitting up odd articles. Table tops like the one shown in Fig. 9 are offered in a variety of forms, one being that of a checker board. Borders can also be used to advantage on picture frames, while for box covers,

Fig. 6.—Scroll Pattern for Upright Panel, 10 by 25 Inches.

panels, and so on, the designs which may be obtained are both numerous and appropriate. Charles W. Spurr, 522 Harrison avenue, Boston, is the manufacturer.

Night Classes of the Ohio Mechanics' Institute.

When in Cincinnati recently we spent an evening in the School of Design of the Ohio Mechanics' Institute. To see nearly 300 pupils, some of them men grown, and all of them from shops and factories, earnestly engaged in drawing or in modeling, or attending recitations in elementary geometry and mathematics, was an impressive spectacle, the like of which is not frequently witnessed. The departments maintained by the institute comprise that of mechanical drawing adapted to the wants of machinists, engineers, metal workers, pattern makers, founders, blacksmiths and the like; architectural drawing, including building construction for carpenters, masons, woodworkers, &c.; artistic drawing, embracing free-hand drawing, perspective and crayon adapted to the wants of plasterers, cabinet makers, &c. They also include the study of original design for advanced pupils and instruction in designing as applied to furniture, jewelry, silver ware or ornamental ironwork, wall and ceiling decoration, carpets, laces, &c. Special classes give attention to modeling in clay and to elementary geometry and mathematics. The present session is the twenty-sixth regular term of the school, and it is sufficient evidence of its prosperity and the usefulness of the work which is being done to say that there are no vacancies, and that the applications of pupils for admission always exceed the number which can be accommodated. Mr. John B. Heich is the principal, and is assisted by an earnest corps of teachers, who occupy responsible positions as foremen and engineers in some of Cincinnati's most important manufacturing establishments. The class in elementary geometry and mathematics is a new feature, and is in charge of Mr. J. B. Stanwood, foreman draughtsman for the Lane and Bodley Co. One of the teachers in the mechanical department is Mr. Bert L. Baldwin, of the same establishment. The beneficial effect which systematic instruction of this kind is having upon the rising generation of artisans cannot be overestimated. It promises well for the progress and prosperity of our manufacturing interests for the future.

Fig. 7.—Border, 2 Inches Wide.

Builders' Sheet Metal Work.

BY A. O. KITTREDGE.

SHEET IRON ROOFS.

There is hardly a subject of more importance for the builder to consider, in the erection of the structures under his management, than the kind of roof which he shall employ for covering them. He has the choice between a large number of different materials, each one of which has some special qualities to recommend it for use, but none of which are satisfactory in all particulars. The present is the era of cheap roofs, and whatever material is employed, one of the prime considerations determining its selection is its cost. Sheet-iron roofs came into prominence a few years since, on account of the remarkably low price at which they were furnished. Enough impetus was given to the trade to build up a large business, and to obtain the general introduction of iron roofs throughout the country. When the rise in the price of iron occured some two years since, iron roofs were at once put upon their merits in competition with other materials, the increase in cost compelling the manufacturers to charge almost or quite as much for them as was asked for other materials with which iron may be considered in competition. That the industry has not flagged, or the use of iron roofs become less general in the meantime, is strong evidence that there are intrinsic merits about this kind of covering to recommend it for use.

Although the introduction of sheet-iron roofs may appear to have been a recent event, iron has been used as a roofing mate-

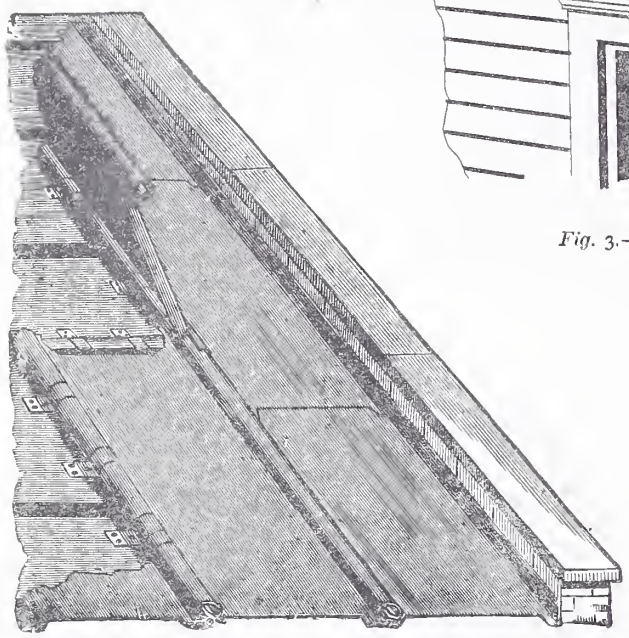
Fig. 8.—Border.

rial in substantially the same form as now employed for a long term of years. Manufacturers have no difficulty in pointing out roofs which have been in use fifteen, twenty-five, and in some cases even forty years, which are, for the most part, in good condition at the present time, and which bid fair to last for a number of years to come. On the other hand, the opponents of iron roofs have no difficulty in citing cases where iron roofs have given out and become worthless in a period of five, four, and sometimes even three years. The question naturally arises, What are the reasons for such great discrepancies in the results obtained? One reason for the durability of a sheet-iron roof is the good quality of the iron employed. An inferior iron with porous texture will not endure in the atmosphere as long as one of good quality, free from scale and smooth rolled. In some cases too light a gauge of iron has been employed. A very thin sheet of iron is more liable to rust through in a given time than one of greater thickness. Still another reason why some roofs last, and why others under almost the same conditions fail, is the character of the paint employed upon the iron. In the use of black iron for roofing purposes, paint is the only protection the iron has from the action of the atmosphere. If the paint be of good quality and properly applied, the roof is much more likely to last than if opposite conditions prevail. Many sheet-iron roofs in the past have been laid over lath, or directly upon purlins, leaving the under side of the iron exposed. Moisture from within the building causing condensation is, under such conditions, an element of destruction. An iron roof laid in this manner, as compared with one laid over tight sheeting boards, or upon felt, is not likely to be durable. These are some of the general principles which underlie the successful employment of sheet iron for roofing

Fig. 9.—Table Top, 18 Inches in Diameter.

purposes, and are points which it is well for every practical builder to carefully examine when determining the covering which he is to employ upon his buildiugs.

A sheet-irou roof is not so much of a novelty in building practice as it might at first seem. A tin roof is only a sheet-iron roof of another kind. In a tin roof, so called, dependence is placed upon a coating of tin, or some alloy, to resist the action of tho atmosphere. In an iron roof dependence for the samo results is put upon the paint with which it is covered. The inferior quality of much of the tiu and terne plates which have beeu employed in recent years for roofing purposes, has resulted in great dissatisfaction with tin roofs. This circumstance has no doubt stimulated tho trade in iron roofs, for manufacturers have claimed with reason, that a good iron roof was better than a poor tiu roof. This reduces the matter to a question of the relative value of a thin coat of tiu and a good coat of paint for protectiug irou against oxidation.



Sheet Iron Roofs.—Fig. 1.—*Gencral View of thc Outcalt Roof.*

The essential differences between the several iron roofs now in the markot consist of the methods of making the seams which are nccessary in the construction of a roof, and the manner of attaching the sheets of iron. A good iron roof, like a good tin roof, requires to be thoroughly fastened to the sheeting boards upon which it is placed. It should be laid with joints which admit of more or less play, to accommodate the contraction and expansion of the material. Further, the iron must be so managed as to makc watertight joints against chimneys, skylights, fire walls, aud the like. The accompanying illustrations are, for the most part, taken directly from the circulars of iron-roofing manufacturers, and are introduced to show the peculiar characteristics of the several iron roofs now before the public. They are presented not in the sense of being exhaustive, but rather as typical examples of the several general classos of roofs being made. Roofs of satisfactory quality can be obtained by the use of almost any of the forms now in the market, and a good iron roof can be made without infringing upon any of the patents. A model roof of sheet iron, as we have already said, should combine the same general features as those essential to a tin roof, and sheet iron may be used to advantage, so far as the roof itself is concerned, in the forms peculiar to standing-seam tin roofs. But as this would involve much labor by hand which may be as well done by machinery, opportunity has been given to inventors and manufacturers to lessen the cost of iron roofs by doing much of the preparatory work in factories equipped with special machinery. The patents on iron roofs relate to the peculiar manner of making the seams and cross joints, to the form of cleats and anchors employed, and the general manner of laying the roof.

In Fig. 1 we show what is known as "Outcalt's Patent Roof," manufactured by Messrs. Caldwell & Co., Cincinnati, Ohio, which is one of the pioneers among the iron roofs now before the public. The great advantage claimed by the manufacturers for this roof over others, is that it possesses an elastic joint. The sheet that is raisod in the upper part of the engraving shows the manner of forming the side seams. The cross seams are made by locking. Cleats are employed in the same general manner as with standing-seam tin roofs, a change in form being made only to accommodate the difference in the seam. Another roof of this same general character is shown in Fig. 4, and is made by the Eureka Iron Roofing Co., also of Cincinnati. It is more

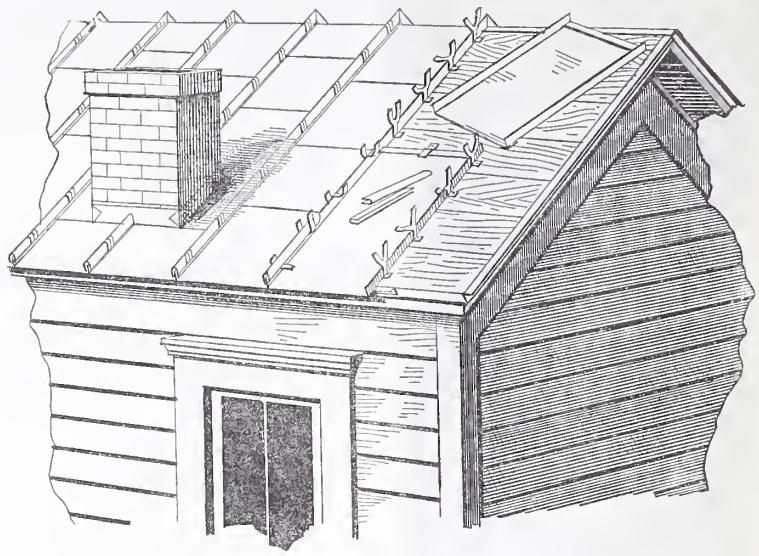


Fig. 3.—*General View of Northrop's Iron Roof.*

recent in its introduction, but has gained a considorable degree of popularity. The side seams are similar in form to the Outcalt roof already mentioned, but the iron is double and curved around backward, so as to admit of nailing through the edge of the sheet directly into the roofing board, thus obviating the necessity of cleats along the side seams.

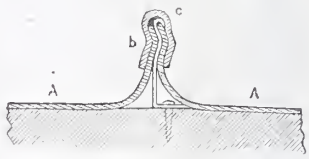


Fig. 5.—*Manner of Making the Seams in the Scott Iron Roof.*

Anothor iron roof, and ono which, perhaps, approaches as closely to its prototype, the standing-seam tin roof, as any now in the market, is shown in Fig. 2, and is mauufactured by Messrs. T. C. Snyder & Co., of Canton, Ohio. In laying this roof the edges of the sheets are turned similarly to the sides of the strips of tin prepared for standing-seam roofing, and these are fastened in place by means of a split cleat, one arm of which doubles over the narrow flange, and the other carries up, as shown by *f* in the engraving, to receive the lock turned on the wide flange. The completed seam, as made by this system, is shown at the left in the cut.

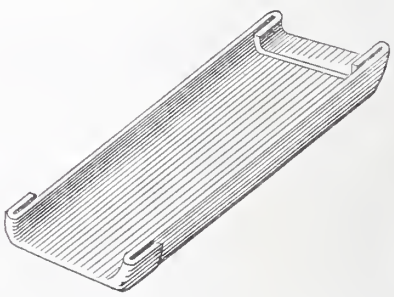


Fig. 6.—*General Vicw of a Sheet of Iron as Prepared for Scott's Iron Roof.*

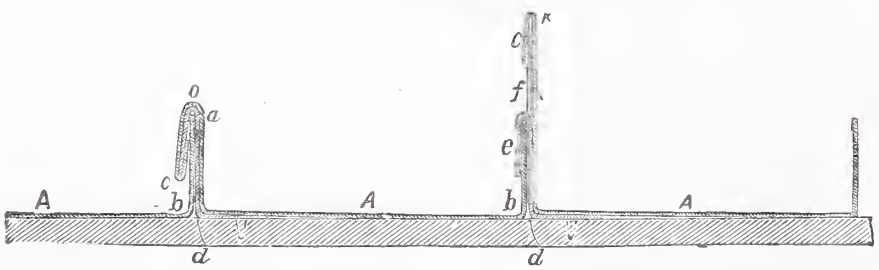


Fig. 2.—*Cross Section through the Roof.—Manufactured by Snyder & Co., of Canton, Ohio.*

Fig. 4.—*General View of the Ureka Iron Roof.*

Instead of making a double seam in this general manner, a favorite resort of iron-roofing manufacturers has been the employment of a cap fitting over the edges turned up along the sides of the sheets. Some half dozen or more roofs of this general description are in the market, varying among themselves only in some of the minor details of construction. We have illustrated only two of these, which serve as a general indication of the class. Fig. 3 shows the roof manufactured by Messrs. A. Northrop & Co., of Pittsburgh. The special features of this roof are the shape of the cleat employed, and the manner of attaching the cap to the seams by means of it. As shown in the engraving, the cleat is fastened to the roof boards alongside of the edges turned up on the sheets. It is then folded down over the edges, one-half in each direction. The cap is then put in place and the ends of the cleat are bent back over it from the opposite sides, thus making the cleats do the double duty of holding the sheets of iron to the roof and the cap covering the seams in position. The roof manufactured by the Gary Iron Roofing Co., of Cleveland, Ohio, is similar to this in its general features, save that the cap, instead of being held in position by means of the cleat, is riveted in place. Another difference which we might mention in this connection is that the Gary iron roof is sent out in rolls, the edges of the pieces being turned with the tongs on the roof, while the Northrop roof is shipped with the edges already laid by the makers, is that it is the only iron roof that has both side and end flanges made in the factories. This is shown by Fig. 6.

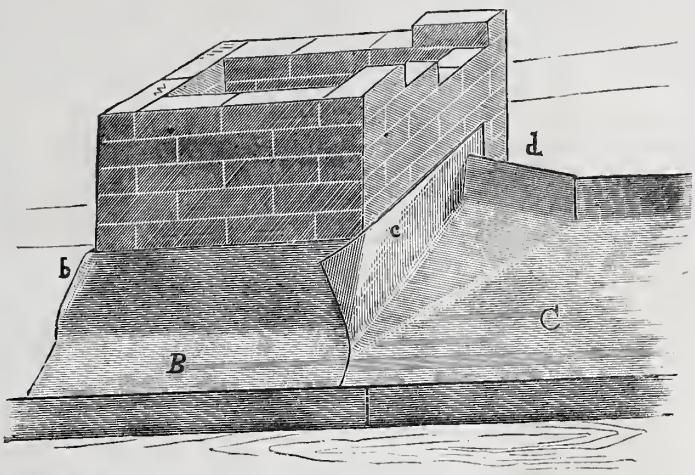


Fig. 9.—Flashing Around Chimneys.—Manner of Making Joints and Arranging the Parts Above the Chimney.

There are still other styles of iron roofing in use which might be mentioned in this connection. Some of these are known as "corrugated roofs," the term, however, not being used in the ordinary sense as employed by iron workers, but rather as indicating one or more

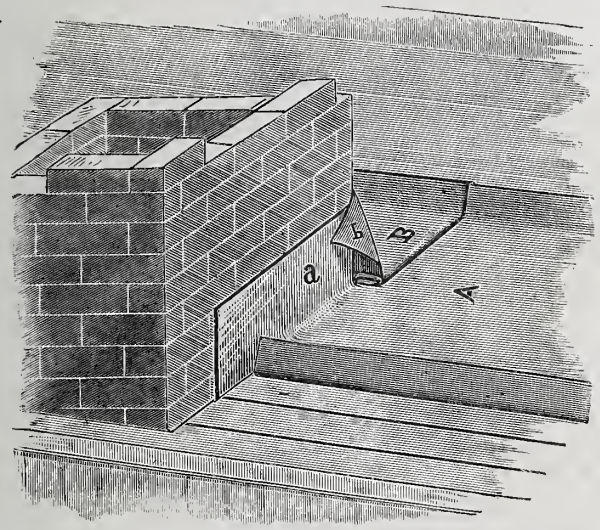


Fig. 7.—Flashing Around the Chimney.—Manner of Arranging the Flanges and Seams in the Lower Side.

bent. Another roof of this same general description is manufactured by L. D. Ward, of Niles, Ohio, in which a wedge or pin is employed, in place of the rivets, for holding the caps in place. Figs. 5 and 6 illustrate a roof manufactured by Messrs. Scott & Co., of Cincinnati, which also belongs to the same

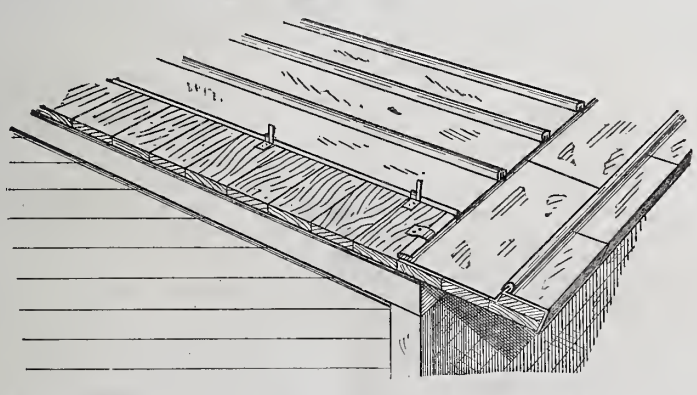


Fig. 8.—Method of Making a Gutter in an Iron Roof.—Employing a Wooden Strip to Get the Necessary Fall.

general class. In this roof the caps are held in place by crimping or counter-sinking the seams by means of a special tool devised for the purpose. The appearance of the seam, as made in this manner, is indicated by the cross section in Fig. 5. A feature of this roof, and one upon which special stress is

V or U shaped crimps running through the center of the sheet. These are intended to overcome more or less of the evils of contraction and expansion. What is known as crimped roofing sometimes also possesses these general features, but this term is generally restricted to a roof having an inverted V-shaped seam over a corresponding strip of wood placed at the sides of the sheet.

Whatever the style of iron roof used may be, much of the value of it will depend upon the workmanship with which it is laid, and the care that is taken in flashing about the chimneys and in forming the gutters and valleys. I have known cases where tin was resorted to in order to make water-tight joints about chimneys, skylights, &c., simply because the latter could be soldered. On the other hand, the best workmanship in tin roofs does not necessarily employ solder in such places. Water-tight joints can be made under all ordinary conditions, either in iron or tin, without dependence upon solder or its equivalents—cement, putty, and the like. How this may be done about chimneys in an iron roof is illustrated in Figs. 7 and 9 of the engravings, which are taken from the catalogue issued by Messrs. A. Northrop & Co. The method employed by this firm is to bring the courses from below, as shown in Fig. 7, up to the lower side of chimney, and turn up an edge 3 inches wide. The part extending beyond the corner is trimmed down 1 inch and turned over to form a lock. A piece wide enough to turn against the chimney 3 inches and to extend to the next standing seam, and long enough to lock on to the lower sheet, is then used in the manner shown by B in the engraving. At the top it is made to

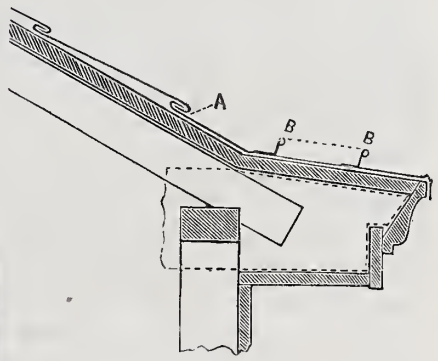


Fig. 10.—Plan of Making a Double Gutter in Connection with a Sheet Iron Roof.

extend 2 inches above the chimney. The side turned up is cut down even with the upper corner of chimney, and the notch flattened out. A lock is then turned on the end, and the piece is cleated in its place. The lower seam is shown in Fig. 9, the part C extending 2 inches beyond the chimney and locking into the piece below. By bending the sheet and turning the edges, as shown at D, a higher point is formed in the roofing at the center of the chimney, in a way to turn the water around the corner. After the edges have been turned against the chimney in this way, the whole is counter-flashed by sawing into the mortar joints above and wedging pieces of iron in position. Careful workmanship upon some plan analogous to this will undoubtedly produce water-tight work under all ordinary conditions. Paint is freely used in the seams and on the flashing pieces, to give the parts the greatest possible durability.

The manner of making gutters in an iron roof is also a feature deserving attention. One of the common methods in use is the ordinary V-shaped gutter, constructed in the box of the cornice. The management of the

iron in a roof of this kind is very simple. A course of the roofing is laid along the gutter, with one edge fastened to the crown molding of the cornice, and the other turned to receive the bottom of the strips of the roof. Two other forms of gutters are shown in Figs. 8 and 10. In the former a strip of wood is placed along the edge of the roof, varying in width from the lowest point in the gutter to the highest point. By this means proper fall is obtained. The iron is used as a lining in the same general manner as upon the roof itself. A cap seam is run along the edge of the strip forming the fall. The method shown in Fig. 10 is similar to this in some particulars. In laying the roof the eave is covered in the same general manner as described in the case of the V gutters in the box of the cornice. Above the molding at the upper edge of the gutter, however, another sheet of iron is slipped in position, which is made of varying width, in order to give the necessary fall. The lower edge of this is turned up, as shown by B B in the engraving. Since the gutter is one of the first parts in a roof to give out, this last method has advantages to recommend it to use. By the means of construction employed the gutter can be readily renewed.

STRAY CHIPS.

The difference betwen the preacher, the builder and the architect of a church is simply this—one is the rector, the other is the erector, and the third is the director.

Luke Phillips, of Ausable, Mich., is the architect and builder of a hotel in progress in that city at the present time. The building is 400 feet long and three stories high, built of brick. It will be an important additiou to the town.

The streets of one of the Western cities were recently placarded with a large yellow poster, containing the following: "A carpenter wanted soon. No shoemakers need apply," without name, address or date. What meaning of evil portent did this mysterious legend conceal?

The building business of Columbus, Ohio, during the season of 1881, was confined almost exclusively to dwelling houses, and combined stores and dwellings situated about the outskirts of the city. Mechanics were very generally employed. The outlook for the new year is at present favorable.

The new court house for Macomb County, Mich., has been completed and is now occupied. The new jail is almost ready for "boarders." Several new business blocks built this season at Mt. Clements, have been finished and are now occupied. The building trade has been excellent throughout the season.

Martinsville, Va., has caught the building boom. During the last year $40,000 has been spent in building. Pretty good for a village of 600 people. $100,000 will be put in building during 1882. Skilled mechanics are needed. A correspondent says: "A good tinner and a blacksmith who knows his business would find plenty to do and money withal."

The bridge connecting Pittsburgh from the foot of Smithfield street with Birmingham or South Pittsburgh, is being replaced by a structure of more modern design and of a capacity suited to the growing traffic which crosses the Monongahela at this point. The new bridge will be considerably higher than the old one, thus accommodating the funnels of the steamboats that are expected to pass under it, now that slack-water navigation has been secured for that river. At this time the masonry of the piers has made such progress that a number of them are higher than the roadbed of the old bridge, which still remains in use.

The new store building erected in Cincinnati by William G. Fischer & Co. possesses some novel features. The front is Ohio freestone, decorated with richly carved panels in high relief. Both first and second floors are used as showrooms, and show windows are carried through both stories. The front of the second story is made in the form of a projection, so that goods exposed in it can be seen by persons passing along the street. The skeleton of the lower stories was manufactured by Messrs. L. Schneber & Sons. A galvanized-iron cornice, in the form of a pediment, surmounts the top. The latter was executed by James Hunter, and is considered one of the best specimens of work in this line extant.

Foundations for the new Government Building at Pittsburgh are in progress. The site occupied is the corner of Smithfield street and Third avenue, some three blocks above the Monongahela House, and about an equal distance in the opposite direction from the present Post Office and the City Hall. Although the building stands upon comparatively high ground, the free use of piles has been necessary to secure proper foundations. Two pile drivers have been at work traversing the space in parallel lines from front to back and *vice versa*. The piles employed are fine specimens of timber, and are each supplied with a pointed wrought-iron shoe, which greatly facilitates the driving. The building, when finished, will occupy a commanding position, and will be one of the important architectural features of the city.

Toledo, Ohio, has been the center of an active trade in building supplies during the past season. Numerous important buildings have been erected, while the surrounding country has not been backward in a similar direction. Mr. M. B. Bacon, favorably known as the architect of some of the most important buildings erected in that city during the past few years, has had in charge a large mercantile building for Messrs. Ketcham & Nearing, and which was built by J. V. Sanfleet; a business block for R. Brand & Co., and a residence for Mr. George Emerson, both of the latter being built by John W. Lee, contractor. Numerous small dwellings for workingmen have been built throughout the city, and building operations in the aggregate are said to compare very favorably with anything Toledo has experienced for a number of years.

The new depot of the Pennsylvania Railroad Company in Philadelphia, at Broad and Filbert streets, which has been in progress for some time, was formally opened for travel on the 5th ult. The structure is one of the finest buildings for the purpose that has ever been built. The road reaches the new station by means of a bridge across the Schuylkill, a little above and parallel with the old Market street bridge. From the banks of the river to the new building the roadbed is elevated somewhat above the second story of the houses, by means of construction not altogether unlike that employed in some of the elevated roads in this city. New York trains for the West run into this depot, and depart by the same track, thus reversing the direction of travel for the cars, the same as has been the practice on some trains with the old depot.

Boston has done some remarkable things in the way of moving buildings. In widening Tremont street, the Hotel Pelham was moved 13 feet 10 inches. The building is of freestone and brick, 96 by 69 feet frontage, 7 stories, 96 feet above the sidewalk, and weighs 5000 tons, exclusive of furniture, which was not disturbed, nor were the occupants of the stores on the first floor. The pipe connections were kept up with hose. The actual time of moving was 13 hours. The work of moving was begun August 21st and finished on the 25th. The greatest speed was 2 inches in four minutes. Power was applied by screws worked by hand. This should satisfy the most imaginative writer that the moderns can perform feats in the way of moving heavy loads that entirely eclipse anything done in that line by the ancients. The cost of the work was $30,000.

Building has been going on in Paris of late almost as actively as in New York. Spacious mansions are rising beyond the park of Monceau, near the Trocadero. Very high rents are asked, but doubts are expressed as to whether persons disposed to pay them will be forthcoming, and meanwhile there is a dearth of house accommodation of the humbler sort. The masons, carpenters, &c., are loudly demanding higher pay. They declare that all this building proves the wealth of the country, and assert that they ought to share in it. On the other hand, many well-informed persons aver that this building boom is simply due to a plethora of capital in the hands of persons who are afraid to sink it in investments which might be more seriously affected by a political convulsion, whereas a house, even if empty for a while, may pay again in time.

The city of Yonkers, one of the suburbs of New York which has recently become accessible by the extension of rapid-transit facilities, has not been behind the city itself in the amount of building which has taken place recently. Buildings of a public character as well as for private use have been in progress. We can only mention some of the more prominent. A Home for Aged Hebrews, built of gray stone and brick to designs prepared by H. J. Schwarzman & Co., cost $80,000. A Presbyterian church, the designs for which were provided by Lawrence B. Valk, has cost $30,000. Three large factories have been erected at a cost of $80,000. Six four-story dwellings, brown-stone fronts, built to designs prepared by Edwin A. Quick, have been finished at a cost of $50,000. Eighteen two-story cottages have been built to designs prepared by H. Skinner, architect, at a cost of $22,000. A large nnmber of improvements less marked in character have been in progress during the same time.

The new enterprises which have been commenced at Holyoke, Mass., during the past season deserve special mention. The Holyoke Water Power Co. have built a mill building some 200 feet square and three stories high. The Mystic Thread Co. are at present building a new thread mill, which is intended to contain 50,000 spindles. The Dudley & Lyons Paper Co. are just finishing a 10-ton paper mill. The Valley Paper Co. and the Parsons Paper Co. are each building large additions to their mills. A Union Railroad depot is projected, and will probably be built the coming spring. Dwellings are in progress on nearly every street in the place. An Odd Fellows' Hall, with offices, the building costing about $25,000, has been built this season, being designed and superintended by J. A. Clough. A business block costing $15,000, belonging to Leander Davis, has also been built, the plans being prepared by the same architect. A hotel costing $15,000; a block containing two stores and twelve tenements, also costing $15,000; a residence costing $8000, and a double residence costing $10,000, are some of the other important improvements that have been made. E. C. Gardiner, of Springfield, is the architect of the last named.

Mechanics generally appreciate the advantages of standard units of measurement, and delight in precise terms wherever dimensions are to be expressed. The following sketch, which savors of the Burlington *Hawkeye*, will be appreciated by our readers: "I want a piece ov a board sawed off, planed on the outside," said Mr. Donlevy; "we'd a few friends in at the house last night to a christenin', and the lower panel av de dure got kicked out in the merriment." "How wide do you want the piece cut?" asked the carpenter. "The width of the dure, av coorse," replied Mr. Donlevy. "And how wide is the door?" "Well, it's as wide as a chair is long, jist. Ye can jist lay a chair acrass it to kape the childher in and the pigs out, an' it fits as though it wur matched for it." "But all chairs are not the same size," said the carpenter. "Aw, thunder an' turf! yer thicker headed nor a railroad spike; the chair comes up jist even wid the edge ov the windy sill." "But how high is the window sill?" asked Mr. Chips. "Bother the badgerin' tongue o' ye," growled Mr. Donlevy; "it's only the wideness ov me hand, barrin' the thum', higher than the rain-wather that stands outside, and av ye can't make it from that ye lave the job, an' I'll take it to some carpinther that understhands his business and knows the measure av a dure in his head widout makin' a chatychism av himself. Say, can ye cut me the pace off the size av that, ye leather-headed wood butcher, ye, or will I go find a man av yer craft that has half the since he wur born wid?" And he had to go find one.

CORRESPONDENCE.

As we go to press each mail is bringing us plans of eight-room houses, in response to the advertised competition, which closes with the last day of the year. From the number of plans already received, our readers are certain to have ten desirable arrangements of rooms upon which to vote, which will be published in our next number, together with further particulars about the balloting. We trust every subscriber will take a personal interest in the docision of this contest.

Mechanics' Tools.

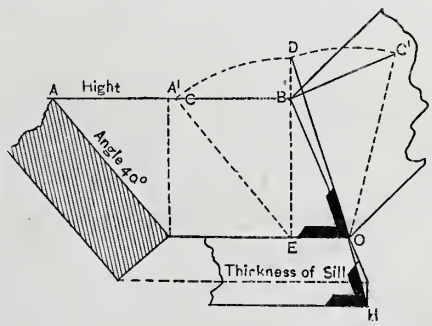
From A. A. F., *Cleveland, Ohio.*—The first thought that comes into my mind concerning this subject is borrowing and lending tools. I wish I were able to do this part of the subject full justice, but perhaps space in *Carpentry and Building* would not be available for me to enlarge upon it. When I began the trade it was expected that every journeyman should furnish his own tools to work with. Nowadays it seems to be that each one expects some one else to furnish him tools. It is said, and I believe it is true, that there is no other trade which has so large a proportion of botches to skilled workmen as that of carpentry. The question arises—why is it so? It seems to me that borrowing tools causes more of it than all other reasons put together. This perhaps is a broad assertion, but arguments can be advanced in proof of it. A first-class kit of tools costs at present from $150 to $250. How many kits of this kind do we find among mechanics? There is certainly not one in 25, if one in 50, that would invoice at the former figure. Can a man do a good job of work without suitable tools? No! Then what is he to do if he has the work laid out for him and he is without the necessary tools? There is no other remedy than borrowing, or else he must bungle the job with tools not adapted to the purpose. It would not pay to buy a tool for a single job—this is the usual excuse—and so men will work on, year after year, without tools enough to complete any one piece of work in a decent manner, except by borrowing. Such men are not real mechanics. They do not start, in the first place, to learn the trade, nor do they ever expect to become first-class workmen. They buy a few tools just to do rough work, and, finding that they can get a trifle more wages at carpentry than they can at driving a team or shoveling dirt, they continue to work in that line. As they have no investment in tools to speak of, they can afford to work for less than regular wages. They are not backward, however, about running to good workmen to borrow. Sometimes they borrow and fail to return them, and then the competent mechanic is forced to hunt up his tools, causing great inconvenience.

It is sometimes claimed that the carpenter does not need many tools nowadays, as work is all got out at the mills. It is said that all the carpenter needs is a saw and a hammer, with which to cut the joints and nail them together. This is a great mistake. Notwithstanding a large amount of the work that was formerly done by hand is now made by machinery, it still requires many different tools and skillful labor to put it together. Even though casings and cornices are ripped out by machinery, I find I often have use for a rip saw, yet I know a workman (he is not a mechanic) who has been in the trade for years who never owned a rip saw. Of course, he has to borrow.

Who are responsible for this state of things? I answer, first and foremost, the bosses are to blame. I have been told more than once, "You need not take many tools; there are two or three men there already with their tool boxes, so there are plenty of tools at the job; a saw and a hammer are all that you need." Directions of this kind are given upon the supposition that if one or two men have tools they must, as a matter of course, allow their use by all the others who may be set to work on the same job. Second, workmen themselves are not blameless. They should not allow others to impose upon them to the extent that is now common. They should have dignity enough to say to their employers, as well as to their fellow workmen, "I buy what tools I use, and I shall expect you to buy yours." This would soon bring about quite a different state of affairs. I do not mean to convey the idea that I would never borrow or lend, for I find it necessary in some cases to borrow, and much oftener to lend. Suppose I have a man at work, and say to him, "I want you to make a window frame with parting stops," and he should say, "I have not got a plow to plow the jams with." I should reply, "Well, I want you to make that frame, and I have nothing else for you to do until that is made." From this the man could at once decide either to buy a plow or seek a job elsewhere. On the other hand, if he should say, "I did not expect to have use for my plow here, and did not bring it; if you can find something else for me for the present, I will have it here this afternoon or to-morrow"—under the circumstances, I would be an unreasonable man if I did not at once offer mine for the present occasion.

Bevels in the Sill of an Octagon Bay Window.

From F. A. S. *Newburgh, N. Y.*—In answer to J. C. A., who inquires in the July number for a method of obtaining the bevels for a bay window sill, I inclose you a drawing illustrating a plan which I consider quite satisfactory for the purpose. I also inclose a



F. A. S.'s Method of Getting the Bevels in the Sill of a Bay Window.

drawing for obtaining the bevels for splay-work or hoppers, whichever term it may be best to employ. To obtain the bevel of the face sill, take the hight of rise A to A¹, and set up from B to C each way. Intersect the two lines at D, one at an arc struck from O as a center, and the other from E. The line from O to D will be the bevel for face of sill. To obtain the down cuts, drop a line from the point of overhang of sill to the line of intersection of the angle of the bay window.. Set off the thickness of sill parallel to face of window. Square up from where the point of overhang cuts the line of intersection of angle to the thickness of sill, and draw a line from H to O, which will be the bevel or down cut. As there has already been so much said about hoppers, I will not trouble you with any directions, but simply inclose a drawing, which may be of interest to your readers.

Cornice Gutter.

From E. P. M., *Natchez, Miss.*—My attention has been called to the suggestion of W. E. B., of Ames, Iowa, published in a recent number of the paper, concerning a construction of cornice gutter. I think the construction would have been greatly improved if, instead of allowing the drip from that portion of the roof between the gutter and the eaves to run over the cornice, he had so arranged the cornice as to throw it into the gutter. The black streaks which are frequently seen upon cornices give the building a mean look, and I think builders would do well to avoid an appearance of this kind. It would be but little trouble in the present instance to change the construction to accomplish the end I mention.

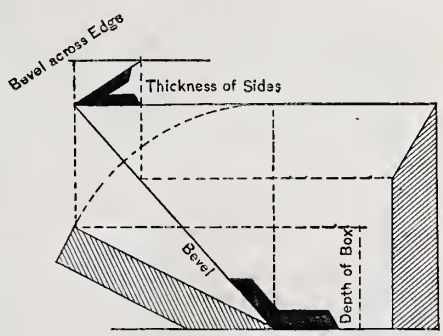
Calculating the Pitch of Rafters.

From L. P. B., *Ausable, Mich.*—I have an old and reliable rule for calculating the length of rafters for any pitch of roof from 1 inch to the foot up. For a roof of one-third pitch, or 8 inches rise to 1 foot run, take 8 inches on the tongue and 12 inches on the blade of a square, which is 1 foot of the width of the building. If the building is 18 feet, measure 9 feet on the top of rafter. The bevel of the face of the blade side and the top of the rafter on the tongue side of the square are the bevels of the rafter. It does not matter how wide the building is. The same rule works on all sizes of buildings. If the roof is more than one-third pitch or less than one-third pitch, it is all on the square. For instance, for quarter pitch take 6 inches to the foot; for half pitch take 12 inches on the blade and 12 inches on the tongue. I have always supposed that this rule was generally understood among builders, but correspondence, as published in the paper, leads me to think that there are some in the trade who do not know of it. I take pleasure in forwarding it.

A Country Town the Place to Learn the Builder's Trade.

From G. H. H., *Philadelphia.*—I consider the answer made to M. H. M. in a recent number of the paper very appropriate in all its relations. By all means let the apprentice learn his trade in some country town, where he will not be driven too fast. Let him have all the necessary time to study the principles underlying his work. Then, if he wants to get along faster, let him step into some city establishment. By this means he will learn the quickest way to put his work together. I have noticed in many cases that the country-made man flourishes in the city. I think I can tell from simple inspection a man that has served his time in the country. He, as a general thing, sees through the work as it comes before him. All seems to be ready to his hand. Ask any foreman where he served his time, and the answer almost invariably is somewhere in the country.

From J. H., *Hempstead, L. I.*—To the young carpenter of Hablem, Mass., whose inquiry appeared in one of the back numbers of the paper, I would say, by all means finish your trade in the country, and, if possible, serve several years as a journeyman before entering the city. Though you may not be able to see the importance of this now, if you carry out this plan you will in future years see the advantage of the course pursued. A carpenter in the country is, as a rule, brought more or less in contact with everything, from a chicken coop to a church. By this experience the country mechanic learns not only framing, but also joinery, and all the other parts of the trade from the foundation to the completion. He is made to understand everything in connection with it. If he improves his opportunities he will also learn something of other trades, such as masonry, painting, &c. On the other

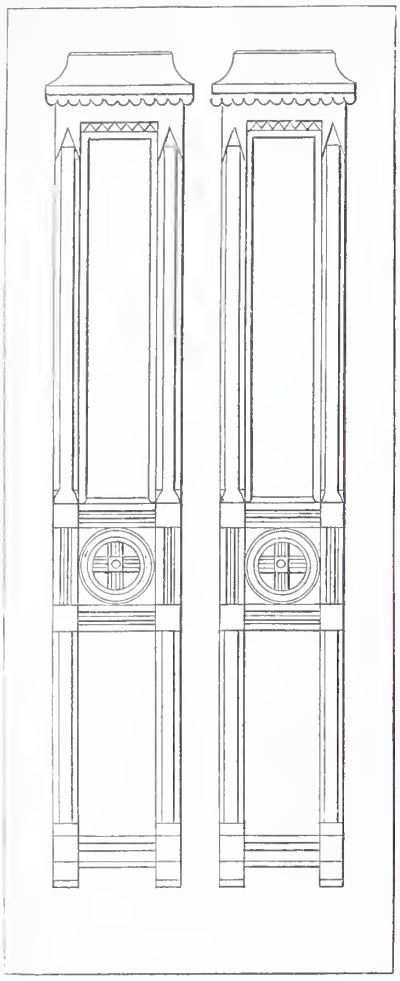


F. A. S.'s Method with Hopper Bevels.—Submitted without Explanation.

hand, labor in the city is more divided, and a man who is experienced in any one branch is not expected to know much of anything outside of his own line. In the country there are more opportunities for doing good work than in the city. For these reasons, and for others, I advise your correspondent to remain in the country until he has gained several years of sound knowledge and practical experience. With a stock of information of this kind on going to the city, he will be apt to succeed when otherwise he would have failed.

Remodeling an Ordinary Four-Panel Door.

From G. H. H., *Philadelphia.*—In the aeeompanying sketches I have shown you the result of some of my play-time. They illustrate how an ordinary four-panel door can be remodeled. The drawings are suffieiently explicit for all ordinary purposes, and therefore need not be described in detail. In this eonneetion I would say that, for general use, the proportions of doors will be found by adding 4 feet to the width; thus a door 3 feet wide should be 7 feet high, and a



Remodeling an Ordinary Four-Panel Door.—Fig. 1.—Elevation of the New Door.

door 2 feet 10 inehes wide should be 6 feet 10 inches high. Exeeptions are made in all rules, including this one.

Solvent for Aniline.

From A. S. B., *Lockport, N. Y.*—I wish to inquire whether you or any of the readers of *Carpentry and Building* ean give me any information with regard to dissolving red aniline for staining wood. I would like also to know the best method of applying it. I have been diluting it with aleohol, but I think there must be a eheaper solvent for it. Any information with regard to the matter will be gratefully reeeived.

Answer.—If we are not mistaken, a very weak solution of aleohol is suffieient to hold the dye after it is onee dissolved. We presume that if the eolor is first dissolved in a small quantity of strong aleohol and then diluted with wood spirit, the result will be the same. A long time ago we tried some experiments with aniline colors, and we found that a very eonsiderable proportion of water eould be added to the dye without causing the alcohol to deposit it. We believe that glyeerine can also be used for dissolving anilne. One of our friends who has used aniline considerably on wooden handles, used to dye them by dipping them in a vat filled with the diluted color. Some kinds of aniline are prepared which are solnble in hot water and somewhat less so in eold. We do not know whether either of these would answer our eorrespondent's purposes. Perhaps some of our readers may be able to furnish something more definite on this subjeet. There is a very good ehapter, eonsisting of a little more than six pages of matter, in Dick's "Eneyclopedia of Practieal Reeipes." In onc of these a German author is quoted, who says that the aniline eolors may be made to dissolve in water by dissolving them in a solution of gelatine dissolved in acetie acid. The aniline eolor is added to this solution, whieh is made like a syrup in thiekness. It is stirred until an evenly-eolored paste is obtained. Then the mixture is heated in a glue pot for some little time. How mueh this will bear dilution we do not know. Some of the direetions allow the dilution of aleoholie solutions of aniline to the extent of one-half with water.

Saw Filing.

From G. W., *Toledo, Ohio.*—I have read with interest A. R. R.'s artiele on saw filing. I have been using saws for nearly fifty years and have always filed my own. I find that to file a saw for cutting off so that it will eut satisfaetorily, the point of the file must be toward the end of the saw. This may produee a wiry edge, but it will be a keen one. I onee got a saw filed, and it seemed to be extremely well done, but on trying it it would not bite. On telling the filer that I eould beat him, he replied that he had always heard that earpenters were hard to please. I said the proof of the pudding was in the eating. A dull saw that has been filed as I deseribed, euts better than one filed in the opposite way. My impression is that nineteen out of twenty earpenters file as I have reeommended.

Protecting Brass from Tarnish.

From G. S., *Lane, Pa.*—How can I keep brass from tarnishing? I have a bird eage that, in a short time after polishing, turns quite green. Is there not some kind of varnish or japan that I can use to eoat it with after it is polished that will prevent it from becoming discolored?

Answer.—After thoroughly eleaning and removing the last traees of grease by the use of potash and water, the cage or other brasswork must be earefully rinsed with water and dried, but in doing it care must be taken not to handle any portion with the bare hand, nor anything else that is greasy. The preservative varnish may be shellae mueh diluted with alcohol, or it may be hard oil finish. We have tried the latter and found it to work very well. In either ease the brass should be made pretty warm, and the varnish or shellae put on with a brush in as thin a coat as possible. In some plaees the stores sell the shellae varnish under the name of "laequer." It is eonsiderably thinner than the ordinary bronze shellac, and rather a nicer artiele. The proportion of shellae to alcohol is about two ounees of shellac to nine ounees of alcohol. Sometimes gamboge is used for a coloring matter to make the varnish more yellow, and sometimes dragon's blood.

Peeling of Paint from Galvanized Iron.

From E. B. P., *Philadelphia, Pa.*—I take the liberty of asking you a few questions, relying upon your promptness for the answer whieh I hope to obtain. We have a galvanized-iron awning at our store. It is eorrugated, painted underneath with white lead paint and on the top with red roofing paint. In the hollows or level parts of the eorrugation the paint has all eracked and peeled off, while on the ridges or raised portions it is as good as if just put on. What I want to know is the eause and the remedy for this. I notiee it is worse on the portion faeing the east than on the one toward the south.

Answer.—We fancy that the cause of the trouble on the awning is to be found in the faet that the level or hollow parts of the eorrugations are so plaeed that they have no opportunity to drain after showers or storms, and that in the aetion of the water we are to look for the causes of the eraeking and peeling. The trouble may have eommenced in the first storm that fell on the awning after it was painted. Some kinds of paint are very sensitive to the action of water while they are fresh, even after they seem to be quite thoroughly hardened. It must be remembered that it is diffieult to make paint hold upon galvanized iron without the greatest care.

Driven Wells.

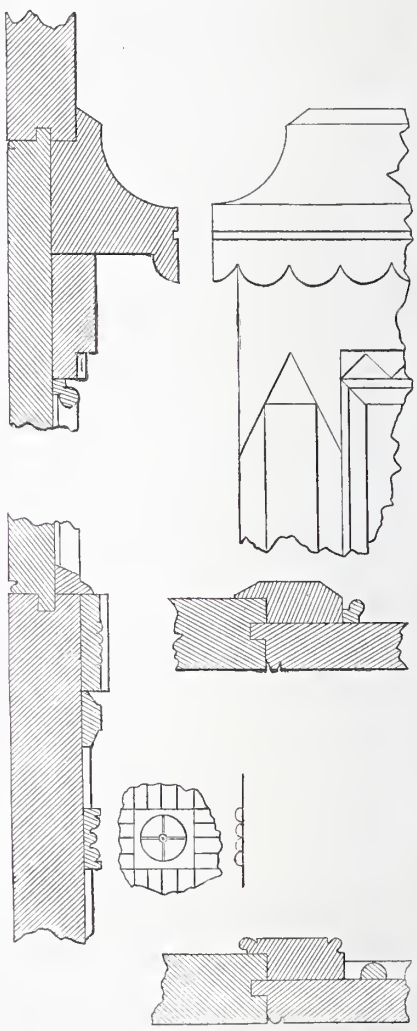
From P. Z. T., *Culpepper, Va.*—If not too mueh trouble, please drop me a line, giving me the address of manufaeturers of drive wells?

Answer.—W. D. Andrews & Bro., 414 and 416 Water street, New York, are the owners of the drive-well patents. These gentlemen supply well points, and also put down driven wells of all sizes and deseriptions. They also sell licenses for different States and Territories.

Fastening Labels on Tin.

From O. R. G., *Hubbard, Ohio.*—Can you give me a reeipe for fastening labels upon tin?

Answer.—We think common gum-arabie dissolved in water will make the best mueilage for this purpose. It should be made pretty thiek, and a lump of washing soda, ¼ inch in diameter, should be added to eaeh half



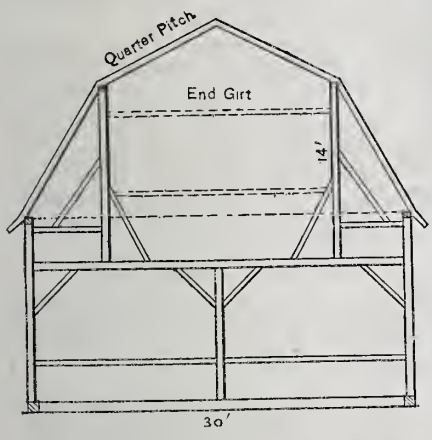
Remodeling an Ordinary Four-Panel Door.—Fig. 2.—Details of the Changes.

pint, and also a half teaspoonful of glyeerine or more, as may be needed. We have heard this reeommended as a good mueilage for the purpose. We suppose that a little tannic aeid added to ordinary glue will make labels adhere very well to tin, but the probabilities are that it would stain the tin and eould not be removed. We have heard a mueilage very highly spoken of whieh consists of 1 part by weight of gum of tragaeanth, 6 parts of glycerine and 80 parts of water. The gum is powdered and the glycerine added. The water is slowly added,

while the mass is rubbed down until it forms a smooth paste. This may take some time. Varnish forms a very good medium for sticking labels to metals of any kind.

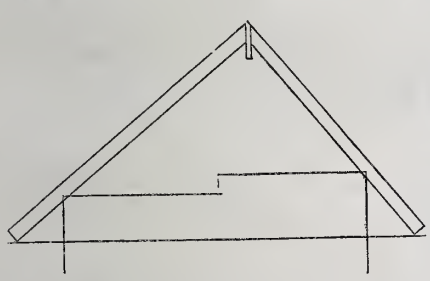
Gambrel Roofs.

From C. M. A., *St. Paul, Neb.*—In the March number of *Carpentry and Building* for last year, on page 57, there was published a plan submitted by A. H. R., for the construction of gambrel roofs. Upon examination of the description and the engraving, I found that the two did not agree. Dividing the width by five, in order to determine the position of the purlin posts, is all right, but in getting the length of the purlin posts



Gambrel Roofs.—Letter from C. M. A.

your correspondent says, take one-fifth of the width of building, which, in the example presented, was 30 feet, giving 6. Add to this one-third of itself (two), giving 8 feet as the distance above the top of main plate. This does not agree with the drawing, as may be seen by measuring. If he used 8 feet, he would get only two-thirds pitch, while the drawing gives five-sixths pitch for the lower section of the roof. The rule that your correspondent presents works correctly if two-thirds is substituted for one-third. This would give 10 feet, which agrees with his drawing. I object to the construction represented in the sketch referred to, on account of the collar beams employed. With them the use of a horse hay fork, now extensively employed in some sections of the country, would be impossible. To illustrate my ideas of the construction of such a roof, I inelose a sketch in which the collar beams are omitted. I set the purlin posts one-fifth the width of the building, which, in my case, is 30 feet, making their distance from the side 6 feet. Take



Equalizing Projection of Cornice.—Sketch with Letter from C. M. C. H.

one-third of the width of building (10 feet) and use this for the length of the posts above the main plate. Add the distance from the top of beam to the top of the main plate, which will give the total length of the post from top of beam to top of purlin plate. This will produce five-sixths pitch for the first section of the roof. For the top section, I make one-quarter pitch. For the end bents, I raise my beams within 2 feet of the top of main posts. This does away with the 6-foot girt and long braces that are put in girts between the purlin posts. I have four different styles of construction for gambrel roofs. If the readers of this paper are not disgusted with me for the one I now present, I may at some future time submit another one.

Equalizing Projection of Cornice.

From C. M. C. H., *Seaton, Ont.*—In answer to N. A. B., I send the inclosed diagram, which, I think, meets his requirements. Lay out the pitch of rafters with required projection, as shown, and run line of cornice over, so as to give the rafter on the opposite side. From the point of rafter set off projection of cornice, and square up for face line. Take the depth from top of rafter to wall plate for one side, and apply it, as shown, on the opposite side, thus locating the wall plate in position. By this method the points of rafters of the same projection and the cornice are level all around.

Alabastine.

Some time since a correspondent in the West wrote us, describing a material bearing the above name, and requesting a statement as to its merits. He was strongly impressed with it, and desired to employ it in finishing a house which he was building for himself, in case it was as good as represented. The preparation is recommended to take the place of kalsomine, whitewash and paint for inside walls and ceilings. It is made by the Alabastine Company, Seeley Bros., agents, No. 32 Burling Slip, New York City. In order to speak intelligently concerning this material we procured some samples, and have tested it as far as opportunity has permitted. The material is made in a variety of light colors, as well as pure white, and appears to be as easily applied as a coat of paint. It is in this respect superior to kalsomine and whitewash. So far as we can judge from the trials we have made, this coating does not rub off upon the clothes like whitewash or kalsomine. It is apparently solid, appearing more like distemper painting than anything else with which we can compare it. It seems to work as well upon wood and stretched cloth as it does upon a wall. The makers recommend it for use upon rough places, as well as upon hard finish. We have not, however, tested it in this particular. The covering qualities appear to be very good. The manufacturers assert that a five-pound package will cover 450 square feet. This appears to us to be within the truth. So far as we have had an opportunity to investigate it, the material appears to be a valuable addition to present resources for interior decoration, and it bids fair to do away with the use of kalsomine, &c. We take pleasure in recommending it to the attention of our readers, and shall be pleased to know what success attends their use of it.

Construction of Triangle.

From R. N. P., *La Crosse, Wis.*—Your correspondent, J. G. W., of Nevada, Iowa, gives the rule for construction of triangles correctly, but has made a mistake in figures. Suppose a pole, 90 feet high, breaks so as to reach 30 feet from the base, how high did it break? My method of solving questions of this kind is as follows: Square the total hight, $90 \times 90 = 8100$. Square the distance from the base to where the end touches—in this case 30 feet—$30 \times 30 = 900$. Subtract the last sum from the former: $8100 - 900 = 7200$. Divide this by double the hight of the pole, $2 \times 90 = 180$; $7200 \div 180 = 40$ feet, the distance from the ground at which the pole broke. The above rule is often quite convenient for use. It is simply the well-known rule of squaring a building 6, 8 and 10, somewhat changed in form.

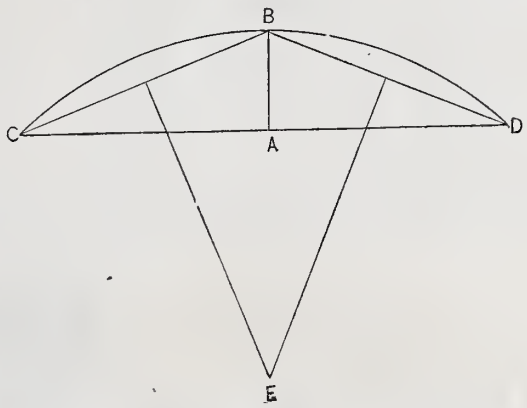
Materials for Plastering.

From J. H. T., *Little Rock, Ark.*—As being of interest to readers of *Carpentry and Building*, I would state that I have found by experience that for 1000 yards of plastering, three-coat work, the following bill of materials is required: 16,000 lath, 108 pounds of hair, 1 keg of nails, 25 barrels of lime, 25 yards of sand and 2½ barrels of plaster of Paris. This is upon the basis that the entire service is lathwork. I have also discovered that ½ barrel of lime and ½ yard of sand will lay 1000 brick. I would like to see in print the views of others on this same subject.

Striking an Arc to Given Dimensions.

From M. L. F., *Lutherville, Md.*—My way of striking the spring of an arch or segment is the easiest that I have yet seen. A description of it may be of interest to readers of *Carpentry and Building*. No calculations are required, and any apprentice can perform the operation. Referring to the diagram, C D is the base and A B is the hight required. Draw a line from B to C, and also from B to D. Get the center of each of these lines and square down until the lines drawn intersect, as shown in the sketch at E; then E will be the center from which to strike the circle, which will pass through the points C B and E.

Note.—This correspondent and others who

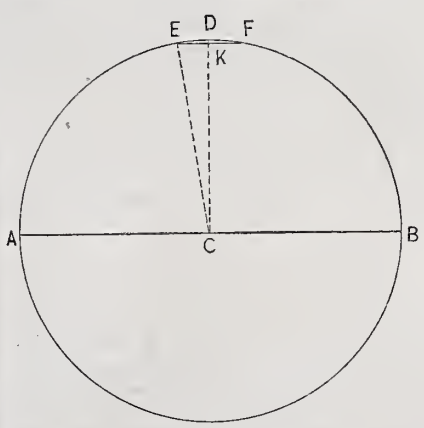


Striking an Arc to Given Dimensions.—Sketch with Letter from M. L. F.

are interested in this problem, are referred to one of the sketches accompanying a letter from W. B., published on page 234 of the volume for 1880, in which this same rule is shown in full, the square being represented in position.

Determining the Rise in a Segment, Chord and Diameter being Given.

From T. W., *Pulaski, Tenn.*—My solution of A. R.'s problem, proposed in the March number for last year, is as follows: Consider A B of the inclosed sketch a diameter, say 16 feet, and E F a chord equal to 2 feet. Find the center of the chord K, and draw K C at right angles to it. From E or F, the extremity of the chord, draw E C. By this construction we have a right-angled triangle,



Determining the Rise in a Segment.—The Chord and Diameter Being Given.

with hypothenuse and perpendicular given, by which to find the other side. C E equals half of the diameter, which, by the conditions of the problem, is 8 feet. E D equals half of the chord, or 1 foot; then $\sqrt{CE^2 - ED^2} = CK$, and $CE - CK = KD$. Substituting the numerical value of the quantities in the equation, we have $\sqrt{8^2 - 1^2} = 7$ feet $1\frac{3}{4}$

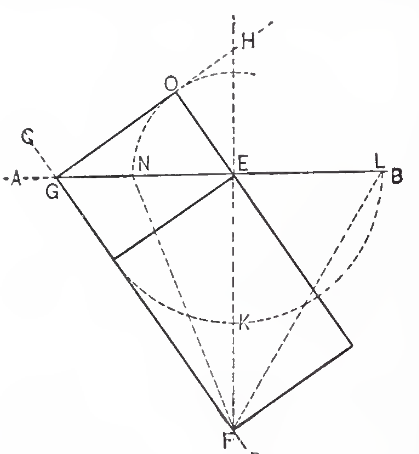
inches; 8 — 7 feet 11¾ inches = ¾ of an inch, the length of K D.

Note.—For other letters on this subject see page 118 of the volume for 1881.

W. B. on Hopper Bevels.

From W. B., *Springfield, Mass.*—Your correspondent L. W. T. has made a joint draft upon A. S. L. and myself. I will endeavor to meet the draft, hoping that A. S. L. will also do his part in the matter. What is demanded is to analyze the rule given by T. S. V. on page 135 of the volume for 1880, and to state the reasons for the steps then taken. I presume the correspondent who furnished this rule uses it because some of the standards told him to. However that may be, he is entirely correct in saying "this is easy if you once see through it." The rule itself is scientific and mathematical. It is a method of getting the angles for a pyramid, and is applicable likewise to hip rafters. A hopper is nothing but a hollow pyramid. The relations of lines, one to another, in different positions is a matter well understood by mathematicians, and it is a great pity that practical men do not comprehend it better. The knowledge is easily acquired and is of great practical benefit.

The points obtained by the compasses in the diagram contributed by T. S. V. can be obtained just as well by the use of a square. The compasses, however, are a very convenient instrument for transferring distances from one point to another, and for this reason was used in the figure referred to. In an

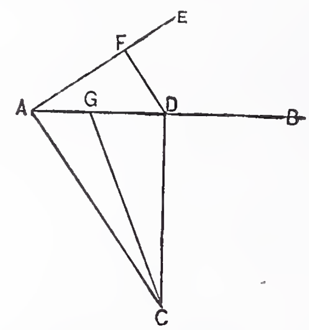


W. B. on Hopper Bevels.—Fig. 1.—T. S. V.'s Rule Analyzed, the Essential Lines being shown Solid.

attempt to explain the principles underlying the rule, I will reproduce the diagram, using the same reference letters, and making all the essential lines of the demonstration solid, and all the non-essential lines, or the lines which represent the operation, dotted. Having called the reader's attention to this comparison of the rule, I propose next to go through the operation of finding the cuts for a box by the rule itself, using, however, the square and a straight-edge, instead of the compasses, in the matter of transferring points. This plan, I think, will show what the rule really is, and make plain the reasons for the steps taken.

Referring now to Fig. 2, lay down the line A B, which represents the top edge of the required hopper. Draw A C to the pitch of the hopper. From C draw a line square with A B, meeting that line in the point D. From A on the line A C square up, producing A E, which represents the upper edge of the stuff. From the point D, draw a line square with A E, establishing the point F. Take the length of the line D F, and lay it off from the point D on the line A B, thus producing the point G. Join G and C. Then B G and G C are the lines by which to set the bevel for the butt joint. The line D F represents the amount gained in running up the side of the hopper a distance whose vertical hight is equal to C D.

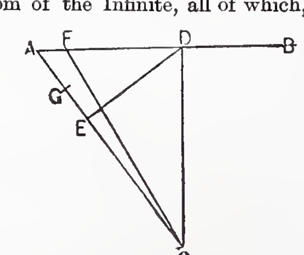
To avoid confusion of lines, I will explain the operation of getting the bevel for the corners by another diagram, rather than include all the work in the one drawing. In T. S. V.'s rule the two operations are combined in one. To make the comparison still plainer, I will perform the work on the left-hand side, instead of throwing it over on the right, as was done in the former case, simply as a matter of convenience. In Fig. 3 lay down, as already explained, the lines to represent the top and pitch of the hopper, A B being the top line, A C the pitch, and C D being squared up from the bottom of the pitch. From the point D draw a line square with A C, thus determining the point E. Set the length D E off on A B, measuring from D, thus establishing the point F. Join F and C; then B F and F C are the lines by which to set the bevel of the corner. This is so because the relation of the lines is such that, on any pitch the point F, obtained as



W. B. on Hopper Bevels.—Fig. 2.—The Same Principles Applied, Using the Square and Straight Edge Instead of the Compasses.

just described, will stand exactly over the point G, G being obtained by taking the length C D on the line C A. This principle was fully explained in the first article on hopper bevels, which appeared in *Carpentry and Building*, on page 57, of the volume for 1880.

I can appreciate the difficulties of L. W. T., from having met similar troubles in the same problem in my younger days. I went to a professor who was a well-known character in this section of the country thirty years ago, and asked him why it was that these lines bore the relations which they do one to another. He said that of all the trees of knowledge, geome-tree was the most important; that on it depended all the branches of science; that I had asked a question high up among the branches. Before answering it he wished to know if I understood things lower down among the roots, and if I could tell why it was that the square root of the sum of the squares of the two sides of a right-angled triangle would give the hypothenuse, or why it was that a point has neither length, breadth or thickness, and why a line has only length, without breadth or thickness. I told him that I could not see the point in that line of reasoning. He then said that in geometry there are two things to be remembered, one was axioms, the other inherents. The axioms are things which any fellow ought to know without being told. The inherents are things that are so because they are so, or because the Infinite Being had seen fit to make them so. He thought it was very unbecoming in me, a finite being, as he said I then was, to question the wisdom of the Infinite, all of which, though



W. B. on Hopper Bevels.—Fig. 2.—The Bevel for the Corners Obtained in the Same Manner.

it did not serve to enlighten me upon the point that I desired to know about, caused me to think, great is the professor and small is W. B.

Beveled Gear.

From G. C., *Auburndale, Mass.*—Referring to J. E. W.'s inquiry for explanation about teeth for bevel wheels, published in the September number, I would say that his best plan is to secure the services of a practical engineer. It is impossible for one man to be efficient in every craft. Let each have his own trade, and let him be skilled in that trade rather than spend his time dabbling in a number of others.

Concrete Bricks.

From E. B., *Benton Harbor, Mich.*—Can you or any of your subscribers give me any information concerning the durability of a concrete brick for building purposes? The brick is made by taking ten parts of sand and one part of lime, pressing the same as for ordinary brick, then putting them in a close oven and burning with a charcoal fire for the purpose of hardening.

Note.—We are inclined to think that the article produced is not altogether suitable for the purpose for which it is intended. So far as we remember, the process described is an altogether novel one, and we are entirely unable to give an opinion upon it. As our correspondent describes the manufacture, we do not recognize any chemical action which would give the bricks cohesion or durability.

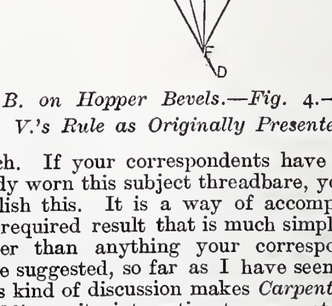
Construction of Polygons.

From T. M., *New York City.*—Further answering the question of one of your correspondents, I send the following table for constructing polygons in the circle:

Number of sides.	Angle at center of circumscribing circle.—Degrees.	Angle at base of elementary triangle.—Degrees.
5	72	54
6	6c	60
7	51½	64¼
8	45	67½
9	40	70
10	35	72
11	32¾	73⅝
12	30	75

The Bevels of Hoppers and Hip Roofs Compared.

From J. P. Randall, Architect, *Chicago.*—In recent numbers of the paper I notice that correspondents are discussing the methods of obtaining the bevels for hoppers. Thinking them a little clumsy at the work, I send you herewith a pencil diagram illustrating a method quite easy of application. There is nothing original in it, the principle being one that I learned from a book some 40 or 50 years ago, when I was practicing what I now

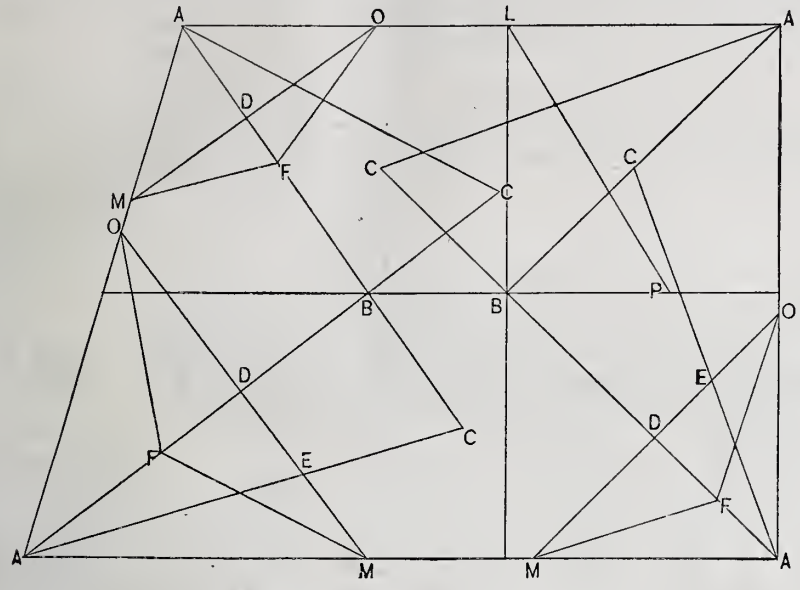


W. B. on Hopper Bevels.—Fig. 4.—T. S. V.'s Rule as Originally Presented.

teach. If your correspondents have not already worn this subject threadbare, you may publish this. It is a way of accomplishing the required result that is much simpler and easier than anything your correspondents have suggested, so far as I have seen them. This kind of discussion makes *Carpentry and Building* quite interesting to me—not that I have anything to gain personally, but I am not too old to learn. The numbers are interesting to me because they carry me back to a time when I was deeply in love with such things. It interests me to engage with the boys in discussions of this kind. My father did it before me and with me.

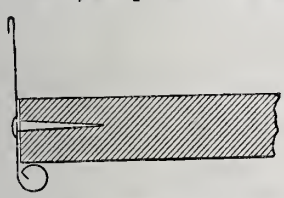
The discussion, so far as I have followed it, leads me to think that many of your readers are not familiar with the correct methods of cutting the bevels and backings for hip raf-

ters, because the same principles are applicable in hopper work as in roof work. My diagram represents the plan of an oblong building, one end of which makes right angles with the two sides, and the other end of which is oblique



The Bevels of Hoppers and Hip Roofs Compared.

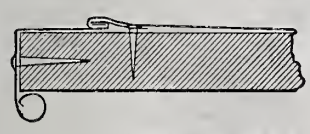
with the two sides. Given the four sides of a building, one of the angles being obtuse, another acute and the two remaining angles right angles, it is required to obtain the bevels or backings of the hips. Make A B in each angle, whether a right angle, acute angle or obtuse angle, the seat of the several hips, and raise perpendiculars to these. On these perpendiculars set up the hight of the roof as shown by B C, and draw C A as shown. These lines then will represent the line of angles of the several hips. At any point on and at right angles with A B draw the perpendicular M O, and produce it to the outside



W. K.'s Method of Finishing the Edges of Tin Roofs.—Fig. 1.—The Strip Fastened to Edge of Roof.

lines of the plate each way. On this line M O take the hight D E, and set it up on the line A B from D, as shown by D F. Then draw F M and F O. The angle F will be the bevel for a backing of a hip for each of the angles in the roof. It matters not whereabouts on the lines A B the lines M O cross, provided always that they cross at right angles to the lines A B.

And now for the hopper. It will at once strike every intelligent reader that the angle F in the diagram is the bevel by which to cut the boards for each and all sides of the hopper, unless it is desirable to construct the hopper with regular miter joints. If this be



W. K.'s Method of Finishing the Edges of Tin Roofs.—Fig. 2.—The Appearance of the Work on Completion.

so, place the bar of the bevel on either of the liues F M or F O, with the blade on the lines A B. This will be the correct bevel with which to cut the miter joint, whatever be the pitch of sides of the hopper. Of course, it will be understood that a hopper is a hip roof inverted, and *vice versa*. If the reader does not at once comprehend this, let M F O D be rotated 90 degrees around the line M D O; this will bring F directly over the point D. Now rotate A B C in the same manner around M D O, and E will occupy the same point in the space as F, and both will be in the line of angle of the hip and directly over D. To cut the upper end of jack rafters, set the bevel to L P B, which will give the cut of the side of the rafters in the hips. It will be the same for all.

Note.—We have no doubt that our readers will be greatly interested in this comparison between hopper bevels and hip rafters, at the hands of an architect who has had such an extended experience as the correspondent whose letter we publish above. If it provokes further discussion upon this subject, which has already received much attention from our readers, we shall not be displeased. So long as the topic is interesting there will be space in the paper for their letters concerning it.

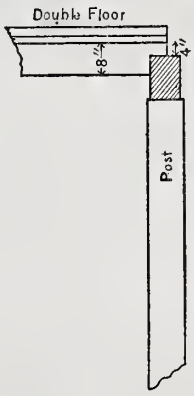
Finishing the Edges of Tin Roofs.

From W. K., *Bradner, Ohio.*—In the volume for last year I noticed a letter from G. S. R., Lakeville, Conn., concerning the finish of the edges of tin roofs. The method he presents is good, but I think he will admit that the plan that I have adopted, and which I shall now attempt to explain, is better. I inclose sketches which illustrate it. I cut my tin 5 inches wide and bead it with an ordinary gutter beader. I fold the opposite side, turning the lock away from the bead. I then put it together as I would gutter, and fasten against the edge of the roof as shown in Fig. 1. I drive a nail in each joint, or at more frequent intervals if deemed necessary. The next operation is to bend it over on the roof and cleat it down as shown in Fig. 2. I place cleats about 10 inches apart. The advantages that I claim for this method over that presented by G. S. R., are that it is less liable to get jammed by leaning a ladder against the edge of the roof, and that it protects the end of the roof boards. I should be glad to have my brother tinners try this plan of finish, and if they please report concerning it.

REFERRED TO OUR READERS.

Calculating Strength of Floors.

From C. L. G., *Fall River, Mass.*—I have a question which I desire to submit to the practical readers of *Carpentry and Building*. Please inform me the weight that will be safe to put on a floor such as represented by the sketch I inclose. The floor joists are halved each end and rest on a 6 by 8 timber. This timber in turn rests on posts set in the ground, and which are 4 feet 6 inches. The posts are 13 feet 6 inches apart in one direction and 12 feet in the other, the latter being the length of the joist. The joists are 2 by 8 inches in size, and are placed with 16 inches between centers. Fig. 2 of my sketches shows the general construction, there being a double floor laid over the joist. I shall be pleased to



Calculating the Strength of Floors.—Fig. 2. —Cross Section Through Girder.

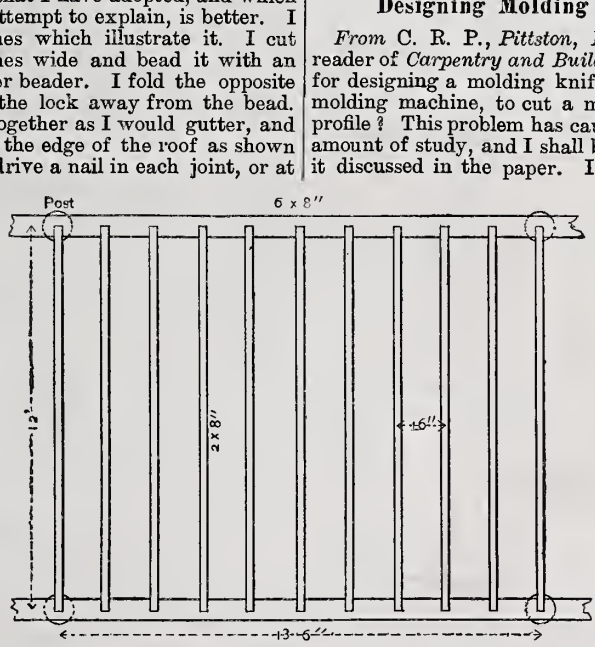
have a full explanation of the method of computing a safe weight to be carried by a floor under conditions of this kind. I desire to hear from some of the practical men, rather than from those who have simply a theoretical knowledge or are familiar with book rules.

Icehouse.

From E. T., *Cottonwood Falls, Kan.*—I desire a good plan for building an icehouse.

Designing Molding Knives.

From C. R. P., *Pittston, Pa.*—Will some reader of *Carpentry and Building* give a rule for designing a molding knife, for use in a molding machine, to cut a mold to a given profile? This problem has caused me a great amount of study, and I shall be pleased to see it discussed in the paper. I will undertake to contribute something myself at a later date.



Calculating Strength of Floors.—Fig. 1.—Plan of Floor Illustrating the Question Proposed.

Counters and Shelving.

From A. P., *Lake Benton, Minn.*—Will some of the readers of *Carpentry and Building* please furnish a few designs for counters and shelving for stores? I think that many will be pleased to see this subject considered.

Iron Shingles.

From E. S., *Freeburgh, Ill.*—I desire to inquire of readers of *Carpentry and Building* if they have used iron shingles, various kinds of which are now for sale in the market. If so, what their experience has been, both as to manner of application and durability ?

Tool Chests.

From I. C. N., *Cleveland, Ohio.*—Will some reader of *Carpentry and Building* please give me a good design for a tool chest ?

Note.—We refer this inquiry to our readers, and shall be glad to publish additional designs of tool chests if they see fit to furnish them. We would remark, however, that this subject was pretty thoroughly discussed in our volume for 1880, but it was not exhausted. Our correspondent is referred to pages 93 and 152 of the volume named.

Home-made Telephone.

From W. H. L., *Winterset, Iowa.*—Will some readers of *Carpentry and Building* furnish me, through its columns, plans and directions for making a telephone ? I desire one to work with linen twine or fine iron wire. The distance is about 40 rods. I specially desire directions for running the wire through a wall.

Camber in a Howe Truss.

From WALTHAM.—I desire to ask the practical readers of the paper what gives the camber in a Howe truss ?

Asbestine.

From C. V. M., *Hannibal, Mo.*—Will some reader of the paper please inform me concerning the durability and strength of a manufactured stone called "asbestine ?"

Brick Oven.

From E. T., *Cottonwood Falls, Kan.*—Will some reader of the paper present the best method for building a brick oven capable of baking four good-sized loaves of bread ?

Calculating the Strains in a Howe Truss.

From S. P. J., *Toledo, Ohio.*—Will you please place the following problems in your columns, to be answered by some of your correspondents ? I wish to know the formula for ascertaining the strain in the struts in a Howe truss; also the tension upon the straining rods and lower and upper chords—say, with lateral weight of 3000 pounds of moving load and 1000 pounds dead per lineal foot. Also the reverse formula; that is, knowing the size of timbers and rods, to find safe load per lineal foot.

Prices of Building Materials in New York, December 20, 1881.

Blinds.—OUTSIDE.

Per lineal, up to 2.10 wide	$	@ 0.24
Per lineal, up to 3.1 wide	....	@ 0.26
Per lineal, up to 3 4 wide	....	@ 0.28
Per lineal, paint'd and trim'd	0 45	@ 0.55

INSIDE.

Per lineal, 4 folds, Pine	....	@ .53
Per lineal, 4 folds, ash or chstnut	....	@ .78
Per lin'l, 4 folds, cherry or butternut	....	@ .96
Per lineal, 4 folds, bl'k wal't.	....	@ 1.06

Bricks—(Afloat.)

Pale	℘ M. $4 25	@	4.75
Jersey	" 7 00	@	7.50
Long Island	" 8.00	@	8 50
Up-River	" 7 75	@	8 25
Havers'aw Bay, 2ds	" 8 25	@	8.75
Havers'aw Bay, 1sts.	" 8 75	@	9.00
Croton—Brown	" 11 00	@	....
Croton—Dark	" 13 00	@	....
Croton—Red	" 13 00	@	....
Philadelphia Fronts	"	@	29.00
Trenton "	"	@	29.00
Baltimore	" ...	@	39.00

Yard prices 50c. ℘ M higher, or, with delivery added, $1.50 per M for Hard, $2.00 for Crotons and $6.00 per M for front Brick.

FIREBRICK. (yard prices).

Red Welsh	$35 00 @	....
Scotch	30.00 @	....
English	30.00 @	32.00
Silica (English)	35.00 @	....
Silica (Welsh)	50.00 @	....
Stourbridge	50.00 @	....
American, No. 1	.... @	40.00
" " 2	.... @	30.00

Afloat, 500 ℘ M less

Cement.—(Cargo rate.)

Rosendale, ℘ bbl.	$1.25 @	....
Portland Saylor's American, ℘ bbl	2.25 @	....
Portland (imported) ℘ bbl.	2 70 @	3.00
Roman "	2.75 @	3.00
Keene's coarse "	6.00 @	....
Keene's fine "	.... @	10 50

Add 25 cts. to above rates for yard prices.

Doors.

RAISED PANELS, TWO SIDES.

2.0 x 6.0	1¼ in.	$1.04	....
2.6 x 6.6	1¼ in.	1.38	....
2.6 x 6 8	1¼ in.	1 44	....
2.8 x 6.8	1¼ in.	1.50	....
2.10 x 6. 0	1¼ in.	1.61	....
3.0 x 7.0	1¼ in	1.86	....

MOULDED.

Size.	1¼ in.	1½ in.	1¾. in
2.0 x 6 0	$1.70	....	....
2.6 x 6 6	2 03	2.59	....
2.6 x 6 8	2 07	2.62	....
2.6 x 6.10	2 11	2.68	....
2.6 x 7.0	2 27	2.71	...
2.8 x 6.8	2 16	2 75	3 84
2.8 x 7.0	2.35	2 83	3.99
2.10 x 6.10	2.28	2.92	4 09
3.0 x 7.0	2.54	3.09	4 37
2.6 x 7.6	2.47	3 02	....
2.8 x 7.6	2.59	3.16	4 43
2.10 x 7 6	2.72	3 30	4.66
3.0 x 7.6	....	3 45	4.85
2.6 x 8.0	2.59	3.16	....
2.8 x 8.0	....	3.31	....
2.10 x 8.0	....	3.47	5 14
3 0 x 8.0	...	3.62	5 42

2nd quality 15 cts. less.

Drain and Sewer Pipe.

Discount 50 to 55 per cent. according to quality and size of order.

Pipe, per foot.	Bends & Elbows, Each.	Branches Sing.	Branches D'bl.	Traps & V. Each.
2 in. $ .13	$ .40	$ .48	$ ...	$1.00
3 " .16	.50	.61	...	1.25
4 " .20	.65	.75	1.30	1.75
5 " .25	.85	.90	1.55	2.50
6 " .30	1.15	1.05	1.80	3.50
7 " .35	1.50	1.20	2.05	5.00
8 " .45	2.00	1.45	2.45	6.00
" .55	2.50	1.70	2.85	7.00
10 " .70	3.00	2.00	3.30	8.00
12 " .80	3.75	2.52	4.24	10.00
15 " 1.25	5 00			
" 1.60	7.50			

(Branches: Longer than 1 ft., charged as pipe.)

House Branches pr. lin. ft.		Sewer Branches pr. lin. ft.,	
15x6	$1.75	15 in.	$2.25
18x6	2.50	18 "	3.00

Glass.—(American.)

Prices current per box of 50 feet.

SINGLE.

Sizes.	1st.	2d.	3d.	4th.
6x 8—10x15	$8.25	$7 50	$7.00	$6.50
11x14—15x24	9.25	8.50	8.00	7.25
16x24—20x28	10.75	9.75	8.75	7.75
15x34—24x30	12.25	10.75	9 00	8.50
26x28—24x36	13.00	11.50	9.75	9.00
26x36—26x44	14.50	13.25	10.75	9.50
26x46—30x50	15.00	14.00	11.25	6.50
30x52—30x54	16.00	14.50	12.00	...
30x56—34x56	17.25	15.50	13.50	....
34x58—34x60	18.25	17.25	15.00	....
36x60—40x60	20.75	18.75	17.25	....

DOUBLE.

6x 8—10x15	$12.75	$11.75	$10.75	$10.00
11x14—15x24	14.50	13.25	12.50	11.25
16x24—20x28	17.25	15.75	14.00	....
15x34—24x30	19.75	17.25	14.50	....
26x28—24x36	21.00	18.50	15 75	...
26x36—26x44	23.25	21.25	17.25	...
26x46—30x50	24.00	22.50	18.00	...
30x52—30x54	25.75	23.25	19.25	...
30x56—34x56	27.75	25.00	21.75	...
34x58—34x60	29.25	27.75	24.00	....
36x60—40x60	33.25	30.00	27.75	....

Sizes above—$10 per box extra for every five inches.

An additional 10 per cent. will be charged for all glass more than 40 inches wide. All sizes above 50 inches in length, and not making more than 81 united inches, will be charged in the 84 united inches' bracket.

Discounts: Single, 60 & 20 %: Double, 70 %.

French

WINDOW, PICTURE AND CAR GLASS.

Prices current per box of 50 feet.

SINGLE.

Sizes.	1st.	2d.	3d.	4th.
6x 8—10x15	$6.50	$5.75	$5.50	$5.25
11x14—16x24	7.25	6.75	6.25	6.00
18x22—20x30	9.25	8.50	7.75	7.25
15x36—24x30	10.25	9.25	8.25	....
26x28—24x36	11.00	10.00	9.00	....
26x36—26x44	11.75	10.75	9.50	....
26x46—30x50	13.25	12.50	10.50	...
30x52—30x54	14.00	13.00	11.25	....
30x56—34x56	15.00	13 75	12 50	....
34x58—34x60	15.50	15 00	13 25	..
36x60—40x60	17.50	16 00	15.00	..

DOUBLE.

6x 8—10x15	$8.25	$7.75	$7.50	$7.00
11x14—16x24	10 00	9.25	8.75	8.25
18x22—20x30	12 75	11 75	10 75	....
15x36—24x30	14.25	13.00	11.25	....
26x28—24x36	15 25	13 75	12.50	....
26x36—26x44	16 25	14 75	13 00	....
26x46—30x50	17 50	16 75	14.25	....
30x52—30x54	18 50	17.25	14.75	....
30x56—34x56	19 50	18.25	16 25	....
34x58x34x60	20 50	19.50	18.00	....
36x60—40x60	23 00	21.00	20.00	....

Sizes above—$10 per box extra for every five inches.

An additional 10 per cent. will be charged for all glass more than 40 inches wide. All sizes above 52 inches in length, and not making more than 81 united inches, will be charged in the 84 united inches' bracket.

Discounts: 50 & 10 & 5 %.

GREENHOUSE, SKYLIGHT AND FLOOR GLASS

Per square foot, net cash.

	case	cut to size
⅛ Fluted plate	10c	16c.
3-16 Fluted plate	13c.	18c.
¼ Fluted plate	16c.	20c.
¼ Rough plate	16c.	20c.
⅜ Rough plate	21c.	27c.
½ Rough plate	28c.	33c.
¾ Rough plate	45c.	55c.
1 Rough plate	55c.	65c.

Hair.

Cattle	℘ bushel, $15.00 @	....
Goat	" 18.00 @	....

Lath.

Cargo rate ℘ M $2.00 @ ....

Lime.

Glen's Falls, or Keenan's common, cargo rate ℘ bbl	@ 1.10
Glen's Falls, or Keenan's finishing Jointa	1.25 @....
Rockland, common	1.25 @....
Rockland, finishing	1.40 @....

Add 25c. to above figures for yard rates.

Lumber.—(Yard prices.)

Pine, very choice and ex. dry. ℘ M. ft. thick	$70.00 @	$75.00
Pine, clear	60.00 @	65.00
Pine, selects	50.00 @	55.00
Pine, pickings	40.00 @	45.50
Pine, selected, box	22.00 @	25.00
Pine, common box	18.00 @	22.00
Pine, common box, ⅝	16.00 @	17.50
Pine 1¼x10, 13 ft., matched, each	.42 @	.45
Pine, 1¼x10, 13 ft., culls	... @	.30
Pine, 1x10, 13 ft., good matched, each	.30 @	.32
Pine, 1x10, 13 ft., common, matched, each	.25 @	.28
Pine, 1x4½, clear, match'd, each	.22 @	.24
Pine, 1x4½, merchantable, matched, each	... @	.18
Pine, 1¼x4½, cl'r, match'd, each	.35 @	.38
Pine, 1¼x4½, merchantable, matched, each	.30 @	.32
Spruce, 1x9, 13 ft., rough.	.20 @	.21
Spruce, 1x9, 13 ft. matched, each	.23 @	.25
Spruce, 1¼x9, 13 ft., rough.	.23 @	.25
Spruce, 1¼x9, 13 ft., matched, each	.28	30
Spruce, 2x9, 13 ft., rough	.37 @	.39
Spruce, 2x9, 13 ft., match'd, each	.43 @	.46
Spruce, 2x4, 13 ft	.15 @	.16
Spruce timber, flat, ℘ M ft	20 00 @	.....
Spruce timber, square ℘ M ft	..... @	22.50
Hemlock, 1x10, 13 ft., each.	.16 @	.18
Hemlock, 2½x4, 13 ft., each.	.16 @	.17
Hemlock, 3x4, 13 ft., each.	.19 @	.20
Hemlock, 4x6, 13 ft., each.	.40 @	.44
Ash, good, ℘ M ft	45.00 @	55.00
Oak	45.00 @	55.00
Oak, quartered	70.00 @	90.00
Maple, common	25.00 @	35.00
Maple, good to 2 in	40.00 @	45.00
Maple good thick	45.00 @	55.00
Maple white	55.00 @	65.00
Chestnut	40.00 @	60.00
Bl'k walnut counters, ℘ ft.	.18	@ .30
Black walnut, selected and seasoned, ℘ ft.	.12½ @	.15
Bl'k walnut, good to choice	105 00 @	125.00
Black Walnut 2d	85.00 @	95.00
Black walnut, ⅝	90.00 @	100.00
Cherry, wide, ℘ M ft	100.00 @	110.00
Cherry, ordinary	85.00 @	95.00
Whitewood, or Poplar ⅝ in.	35.00 @	40.00
Whitewood, or Poplar ⅝ panels	45.00 @	60.00
Whitewood, or Poplar 1 to 1½ inch	45.00 @	55.00
Whitewood or Poplar, 2 in. and upward	50.00 @	55.00
Shingles, extra sawed pine, 18 in.	5.00 @	....
Shingles, clear sawed pine, 18 in., 2 nd	4.00 @	....
Shingles, cypress, 7x24	15 00 @	18.00
Shingles, cypress, 6x20	12.00 @	14.00
Shingles, Cedar, 6x24, No. 1	— @	22.00
Shingles, Cedar, 6x24, A's	— @	16.00
Shingles, Cedar, 6x20, No. 1	— @	12.50
Shingles, Cedar, 6x20, A's	— @	10.00
Shingles, Cedar Eastern.	— @	3.50
Shingles, Hemlock	— @	3.75
Shingles, Pine	4.00 @	5.00
Shingles, Spruce	— @	3.50
Shingles, Redwood (California), ordinary, per bunch.	— @	.85
Shingles Redwood (California) 6x16 cut	— @	1.85
Yellow pine dressed flooring, wide, ℘ M ft	37.00 @	40.00
Narrow ditto	40.00 @	45.00
Yellow pine timber	35 00 @	50.00
Locust posts, 8 ft., ℘ in	.18 @	.20
Locust posts, 10 ft.	.24 @	.25
Locust posts, 12 ft	.25 @	.30
Chestnut posts, ℘ ft.	.03 @	.3½
Mahogany, ¼ in. ℘ ft	.05 @	.07
Mahogany, ⅜ in. ℘ ft	.10 @	.12
Mahogany, ½ in. ℘ ft	.10 @	.16
Mahogany, ⅝ in. ℘ ft	.12 @	.16
Mahogany, ¾ in. ℘ ft	.14 @	.16
Mahogany 1 in. ℘ ft	.18 @	.22
Rosewood, ⅛ in. ℘ ft	.11 @	.15
Rosewood, ¼ in. ℘ ft	.16 @	.20
Rosewood, ⅜ in. ℘ ft	.24 @	.28
Rosewood, ⅝ in. ℘ ft	.40 @	.45
Rosewood, 1 in. ℘ ft	.60 @	.75
Satin wood, ½ in. ℘ ft	.30 @	.40
Satin wood, 1 in. ℘ ft	.40 @	.55
White holley ¼-inch	.10 @	.12
White holley ⅜-inch	.15 @	.18
Cedar (Cuban and Mexican) ℘ ft	.10 @	.14
Cedar (Florida) Less than 1 inch	.16 @	.24
1 inch and over	.25 @	.30
Redwood (California) 1 to 2 in., dry, per M	@	60.00
3 in. and over, per M	@	60.00

Moldings.

50c. to 60c. per inch per 100 feet, according to quality.

Paper.

Rope, waterproof building, ℘ ℔.	16c @	17c
Rosin Sized Sheating, ℘ ℔.	4c @	5c
Dry Sheating ℘ ℔	3c @	3½c
Tarred Felt. ℘ ℔	.... @	3c

Plaster.

Calcined City........Mill rate..$1 25 @ ....

Sash.

GLAZED.

Dimensions of windows.	12 Lights. 1¼pl.	12 Lights. 1¼c.	12 Lights. 1½c.	8 L's. 1½c.	4 Lights. 1¼c.	4 Lights. 1½c.
2.1x3.6	$1.04	1.10	..	....	....	....
2.4x3.10	1.13	1.21	....	....	1.32	....
2.7x4.6	1.36	1.44	....	....	1.67	1.77
2.7x4.10	1.52	1.58	....	....	1.75	1.86
2.7x5.2	....	1.69	....	....	2.03	2.15
2.7x5.6	...	....	....	2.13	2.22	2.35
2.7x5.10	....	....	....	2.23	2.32	2.49
2.10x4.6	1.52	1.63	1.73	....	....	....
2.10x5.2	1.72	1.82	1.97	2.19	2.24	2.39
2.10x5.6	1.83	1.93	2.12	2.33	2.36	2.52
2.10x5.10	2.14	2.26	2.45	2.40	....	2.73

c. means counted checked—plowed and bored for weights.

Hot bed sash, glazed..........$2.42

HEAD LIGHT.

Two or three Lights, Glazed.

Size.	1¼	1½	Size.	1¼	1½
2.6x1.0	46	54	2.10x1.0	54	62
2.6x1.6	58	62	2.10x1.6	69	75
2.8x1.0	54	58	3.0x1.0	58	69
2.8x1.6	62	69	3.0x1.6	76	85

Slate.

By car load, delivered in New York.

Purple roofing slate, ℘ sq're.	$5.50 @	$6.00
Green slate	6.00 @	6.50
Red slate	11.00 @	....
Black slate, Pennsylvania	4.50 @	5.00
Tiles, 1¼ in. rubbed, ℘ sq. ft.	@	.30

℘ sup. ft.

Steps and platforms, 1½ in. thick; Risers, 1 inch thick, prices nominal....

" " 2 " ....

Red tile and borders..........

Coping, 1½ " ....

" 2 " ....

Lineal ft.

Window sills, 4x7..........

" 3x7..........

Window caps, 4x10, plain..........

" 4x8, " ....

" 3x10, " ....

" 3x8, " ....

Stair Material.

BALUSTERS.

Black Walnut.	1½ in.	1¾ in.	2 in.	2½ in
Fancy Turned	10c	12c	15c	22c
Neck Turned	11c	13½c	16½c	23c
Fluted or Octagon	19c	22c	24c	28c

OCTAGON PANELED NEWELS.

Panels Veneered with French Walnut.

8-inch Newels, with Cap	$9.00
9 " " "	10.00
10 " " "	11.00

SOLID NEWELS, WITH CAPS.

Black Walnut.	5 in.	6 in.	7 in.	8 in.
Fancy Turned	$2.25	$2.90	$4.00	$3.25
Octagon	2.75	3 40	4.50	5.75

STAIR RAIL.

Worked out and finished ready to put up. Easements and cylinders counted double. Price per foot Newels and Balusters not included).

Black Walnut.	3 in.	3½ in.	4 in.	4½ in
Molded	44c	48½ c	55c	61c
Toad Back		58c	63c	72c

STAIR RAIL, UNFINISHED.

Price per foot.

Black Walnut.	3 in.	3½ in.	4 in.	4½ in
Molded	13c	16c	18c	21c
Toad Back	17c	19c	22c	

Stone.

Cargo rates, delivered at New York.

Amherst Blue		$1.00
Amherst freestone, in rough, ℘ C ft.		1.00
Bay of Fundy, Wood Point, brown	0.80 @	1.00
Bay of Fundy, Mary's Point, brown	$0.80 @	1.00
Bay of F'dy, Mary's Pt., olive.	0.80 @	1.00
Berlin Blue	.... @	1.00
Berlin freestone, in rough	.... @	1.00
Berea freestone, in rough	0.85 @	.90
Brown stone, Portland, Ct.	1.25 @	1.50
Brown stone, Belleville, N. J.	1.00 @	1.50
Corsehill (Scotch) Red Sandstone	@	1.00
Granite rough	.50 @	1.00
Dorchester, N. B., stone, rough ℘ foot.	.... @	1.00

BLUE STONE.

Rubbed hearth, 10 ft. or under	25c
Rubbed hearth, 20 ft. or under	35c
Rubbed hearth, 30 ft. or under	45c
Rubbed hearth, 40 ft. or under	50c
Rubbed sills	30c
Sawed & Planed	40c
Sills and lintels	@ 18c
Sills and lintels, fine quarry cut sills	.... @ 35c
Coping, 11 to 18 in. wide	20c @ 24c
Coping, 20 to 28 in. wide	38c @ 60c
Coping, 30 to 36 in. wide	65c @ 80c
Steps, 8 in	.... @ 60c
Steps, 7 in	.... @ 55c
Steps, 6 in	.... @ 35c
Steps, door, per in. wide	.... @ 3c
Platforms, promiscuous, 4 in.	.... @ 32c
Wyoming Valley, promiscuous, per cubic ft.	1 30 @ 1.3

Vault Lights.—Nominal.

Platform, sq ft	$3.50
Step and risers, sq. ft.	3.50
Floor light, sq. ft.	2.50
Roof light, sq. ft.	2.50
Platform, 2d quality, sq. ft.	2.60

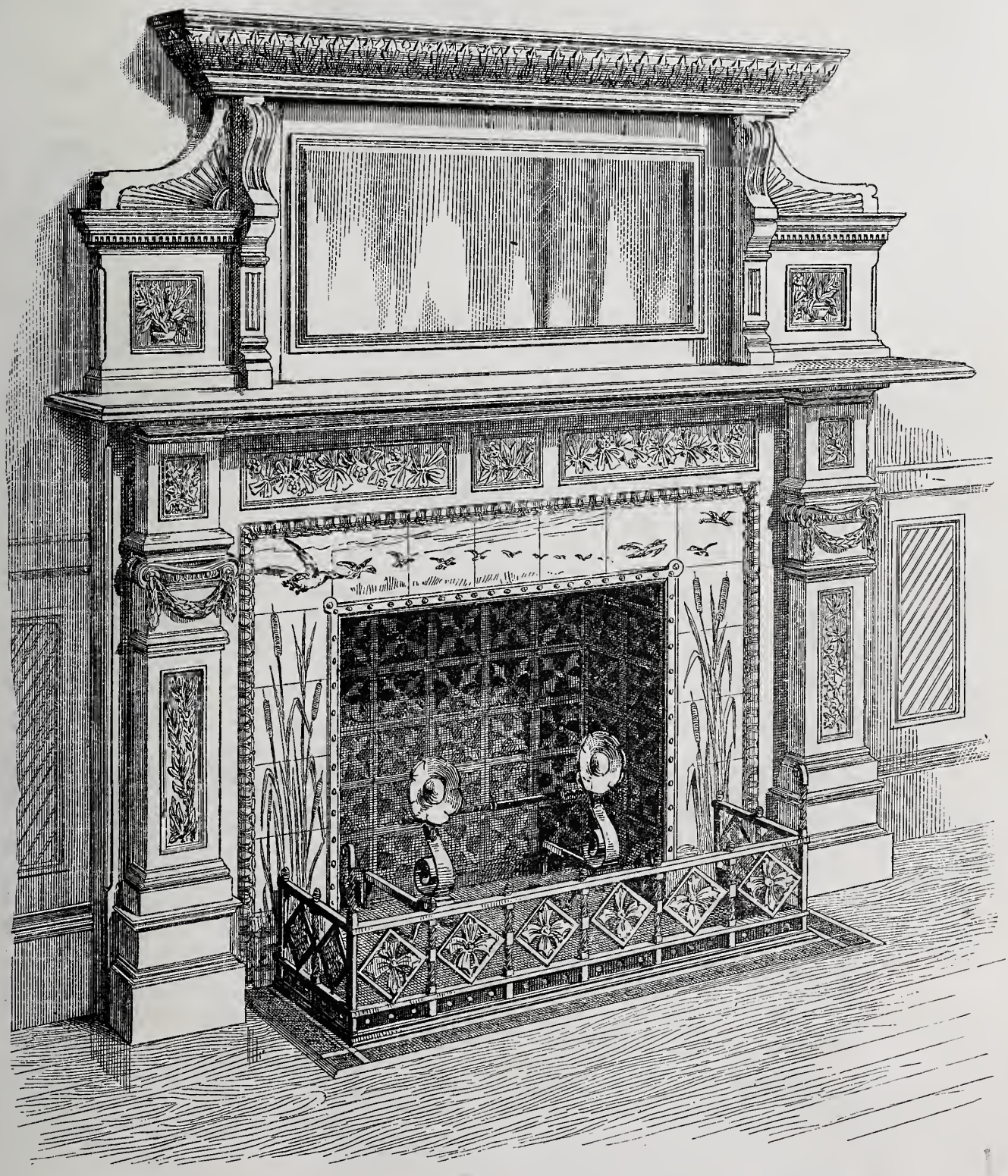
COVERS.

Diameter.	Round.	Hexagon.
14 inch	$3.00	$0.00
16 "	3.75	4.00
18 "	5.50	6.00
20 "	8.00	8.50
24 "	14.00	15.00
26 "	16.00	17.00
30 "	23.50	25.00
63 "	31.00	33.50

CARPENTRY AND BUILDING

A MONTHLY JOURNAL.

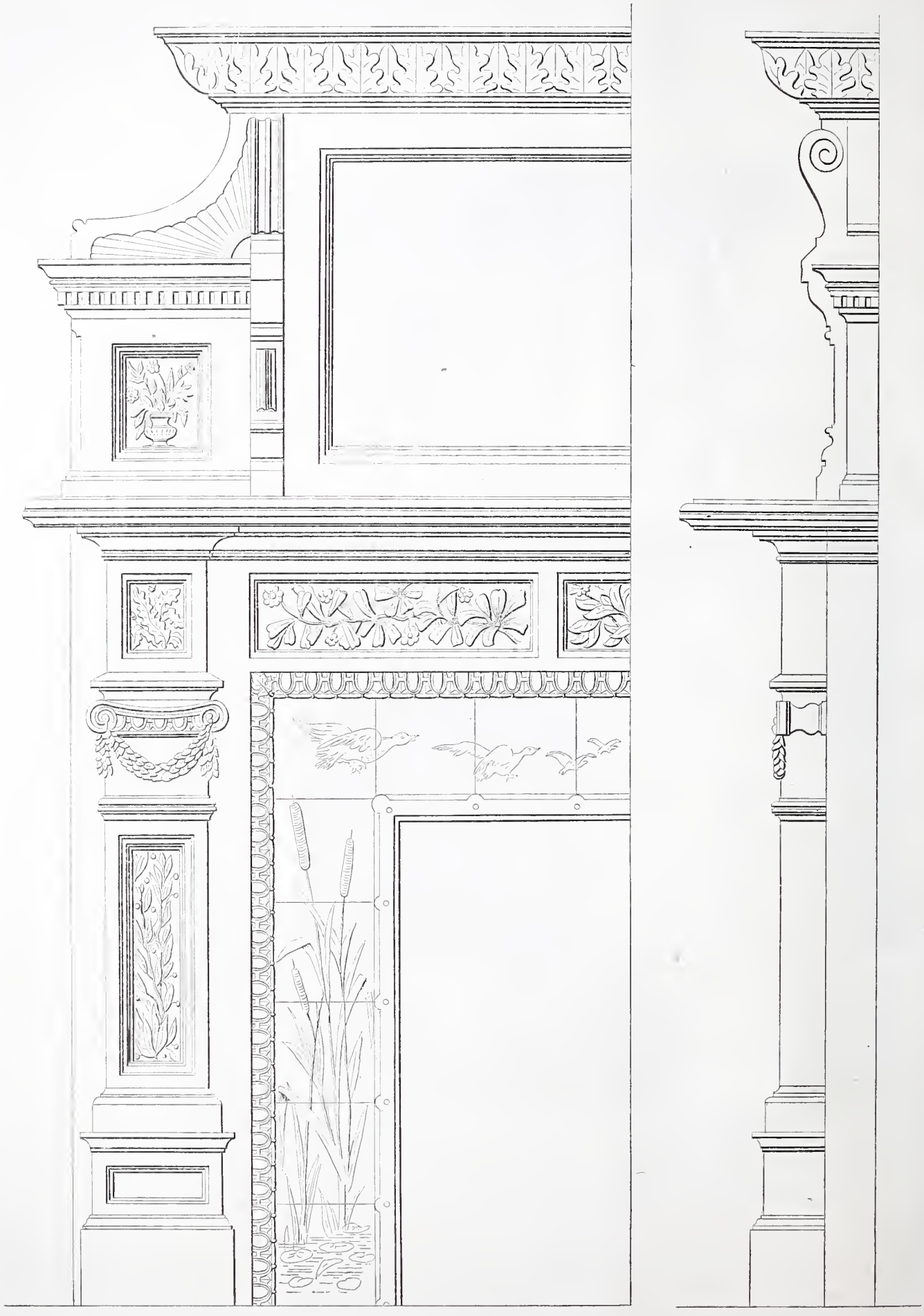
VOLUME IV. NEW YORK = FEBRUARY, 1882. NUMBER 2.



Wooden Mantel, Exhibited by Messrs. Irving & Casson at the Recent Fair of the Massachusetts Charitable Mechanic Association, Boston.

Design for Wooden Mantel.

The original mantel from which the design that appears upon our first page was made, constituted one of the items of the exhibit of Messrs. Irving and Casson, of Boston, at the fair of the Massachusetts Charitable Mechanic Association, held in that city last fall. The design as shown at the fair was executed in mahogany and other dark woods, and presented a very handsome appearance. Its character is such, however, that a good effect may be obtained by the use of other woods. On this page we present a scale elevation and section, following which are details of the more important parts. The pleasing effect in this design is due to several features. The balancing of parts and the general arrangement are good. Enough carved work has been introduced to relieve the plainness which would be otherwise manifested, while the happy selection of tiles and the trimmings of the grate enhance the general effect. Our details do not do the



Design for Wooden Mantel.—Fig. 2.—Half Elevation and Section.—Scale, 1½ Inches to the Foot.

carvings justice. It is, comparatively speaking, impossible to represent in an engraving the fine parts and members in carved work which constitute its beauty. There are contained in the cuts, however, suggestions which, at the hands of a competent wood-carver, would work into very attractive shapes.

Building in Japan.

Of late years new features have been introduced, and now to a very great extent European modes of building prevail. The

Fig. 3.—Profile of Cornice Above Mirror, Half Full Size.

recent importations of bricks by foreigners, for example, has led the imitative Japanese to commence brick-making on their own account, and already they have succeeded in their manufacture to a commendable degree. So far as outward appearance is concerned, the bricks produced by them are quite equal to those imported, but the native workmen require instruction and practice before their handiwork will equal European-made bricks in compressive resistance and impermeability. We need hardly say that, however well adapted for the purpose the raw material used in their manufacture may be, the proper burning of bricks is a nice operation, and one which demands great experience on the part of the operator. If not sufficiently burnt, they will assuredly be soft, porous, and, therefore, comparatively worthless, while, if overdone, they vitrify, or become distorted, and are thus rendered practically useless for building of any kind. These are practical points which have yet to be mastered by the Japanese, who will require tuition from those able to give it ere they become accomplished brickmakers.

In respect, too, of mortar, and other cementing substances, their incompetency is

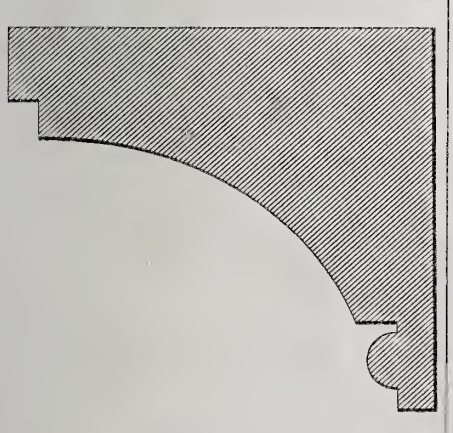


Fig. 4.—Full Size Detail of Bed Molding Under Shelf.

correspondingly apparent. They have, as yet, acquired scarcely any knowledge as to the ingredients essential for their proper production, and less still as to the proportions in which those ingredients should be incorporated. This, of course, is due also to the fact that wooden buildings have hitherto been almost universal throughout the Empire of Islands, and that carpentry has been the branch to which builders have mainly devoted their attention.

When we come to the questions of ventilation, water supply and drainage, we find that the Japanese are, comparatively speaking, in a state of the most profound ignorance. Their arrangements in these respects are as primitive as they were in the days of the Patriarchs. Open drains border most of the streets in the towns of Japan, and get their loathsome contents from under the thresholds of the dwelling-houses, while public wells, into which sewage matter freely percolates, yield drinking water for the inhabitants. It is not necessary to dwell upon the evils likely to arise, and which very frequently have arisen, from this state of affairs. At home a good deal remains to be done before all the hygienic conditions of town existence essential to the preservation of the popular health are complied with, but in Japan nothing, literally nothing, has been accomplished in that direction.

It would be possible to indicate innumerable other defects and shortcomings which are everywhere observable to the eye of the architect or builder throughout the various towns—principal as well as petty—of the Japanese Empire, but enough has, perhaps, been said to demonstrate that a wide field exists therein for the operations of men of science and skilled workmen. Well will it be if our own countrymen are among the first to enter that field, for it is certain that it will be presently invaded, and that the work to be done in it will extend over many years to come. It is only proper, in this connection, to mention some of the drawbacks against which immigrants have to contend. As we have said, the exclusive system which for so many years existed there has been swept away, but it is equally true that the old modes of thought and of action

Fig. 5.—Detail of Dentil Cornice at Sides, Half Full Size.

among its officials have not yet been discarded. The Government has wisely determined to institute Western industries and technical processes wherever possible, and many foreign experts have already reached the country with a view to assisting to that end. Unfortunately these are often met on their arrival, or very soon afterward, by "red tapists," as we should term them, who, "dressed in a little brief authority," and full of antiquated notions, discourage the new arrivals and check their ardor by obstruction.

It is at once found that jealousy and distrust exist largely in the breasts of the men in office, and impel them to place impediments in the way of the would-be improvers of the institutions and social arrangements of the empire. That these vestiges of the old *régime* should still abound is, perhaps, not strange, but they certainly hamper, and frequently to an inordinate and irritating degree, the movements of every reforming foreigner who places his foot on the soil of Japan. Time, and with it the succession of a generation of younger and more enlightened officials, are probably the only remedies for this evil. It must be borne in mind that but ten or eleven years have elapsed since the revolutionary step was taken which permitted strangers to enter the country at all, and it is scarcely to be expected that suspicion toward them, born of the feudal system previously existing, should die out at once. Intercommunication and commercial intercourse with other nations will no doubt eventually install confidence in place of distrust in the Japanese mind, and then the arts and sciences will flourish throughout the now benighted territory of the Tycoon.

Progressive Study in House Building.

According to the announcement contained in our advertising columns, we commence at this time the publication of a series of articles and illustrations which we believe are

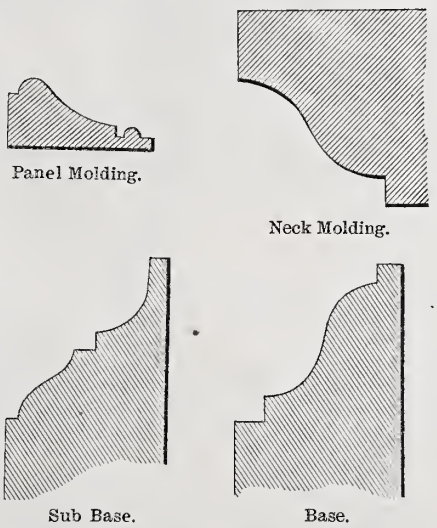


Fig. 6.—Full Size Profiles of Moldings.

aptly described by the title just named. The competitions which we are conducting this year are novel in character, and from present indications we feel sure are likely to be of greater interest and value to our readers than anything we have heretofore undertaken, or has ever been done by anyone in this direction. The subject of our fifth competition was the planning of an eight-room house. We advertised for the foundation, first floor and second floor plans of an eight-room house, in character adapted for building upon an eligible corner lot, 75 feet front by 200 feet deep, and situated in a village or suburban district. The lot was described as fronting toward the east, with a side street bounding it on the south. The house was to consist of eight principal rooms, as follows: parlor, sitting-room, dining-room, and four bedrooms. A bathroom and pan-

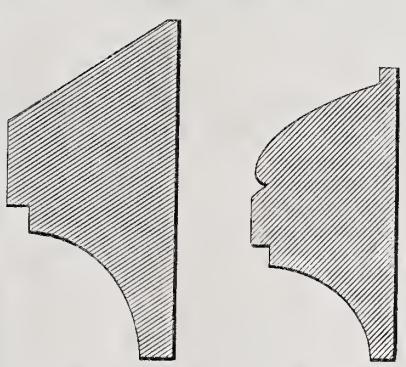
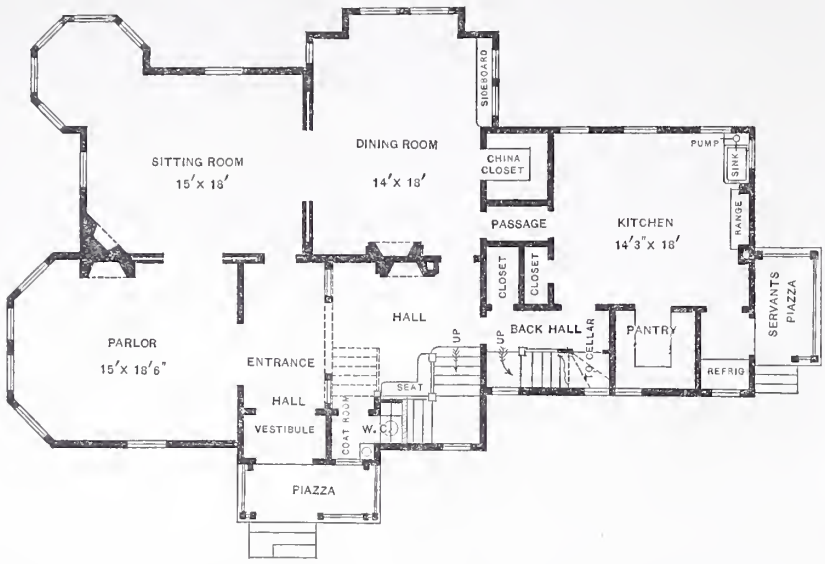


Fig. 7.—Full Size Profiles of Moldings.

try were also stipulated. Vestibules, halls, stairways, passageways, closets, presses, &c., were to be introduced, at the discretion of the designer, to render the house complete in its accommodations. All of these rooms were to be located upon the two principal floors of the building, and the full complement was to be obtained, irrespective of additions which might be expected to come from a basement or attic. It was further stipulated that room for a stairway to the attic should be provided, The rooms named were to be of fair average size. The hight of the stories for all purposes affecting the floor plans was assumed to be 10 feet for the first floor and 9 feet for

the upper, both dimensions named being in the clear. The plans were intended to represent frame houses built upon suitable foundations.



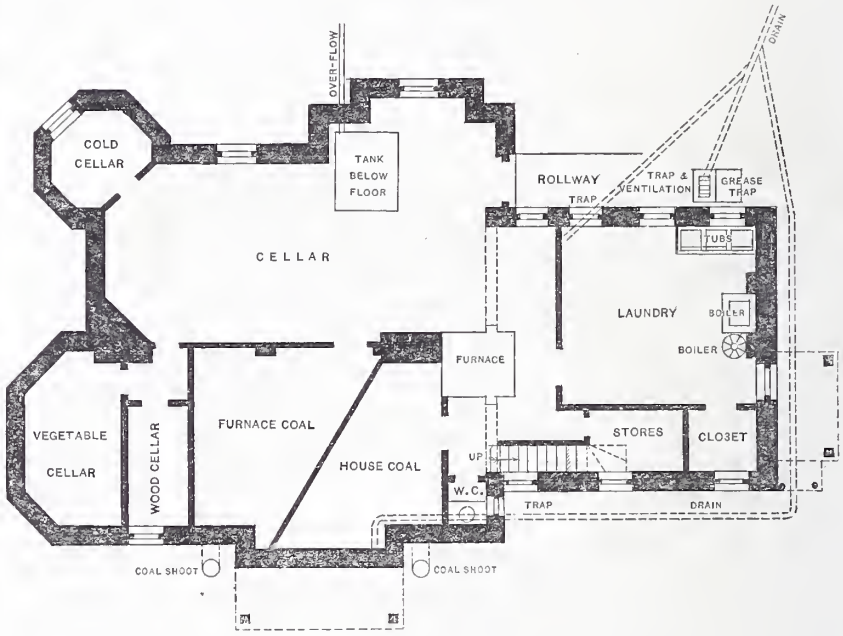
Progressive Study in House Building.—Fig. 1.—*First Floor Plan Submitted by No.* 91.—*Scale,* 1-16 *Inch to the Foot.*

The requirements were the foundation and cellar plan, the first floor plan and second floor plan of an eight-room house, according to this specification. Each set of plans was to be accompanied by a brief description, recounting the special merits of the arrangement shown, and all drawings and writings submitted were to be signed by a fictitious name or *nom de plume*.

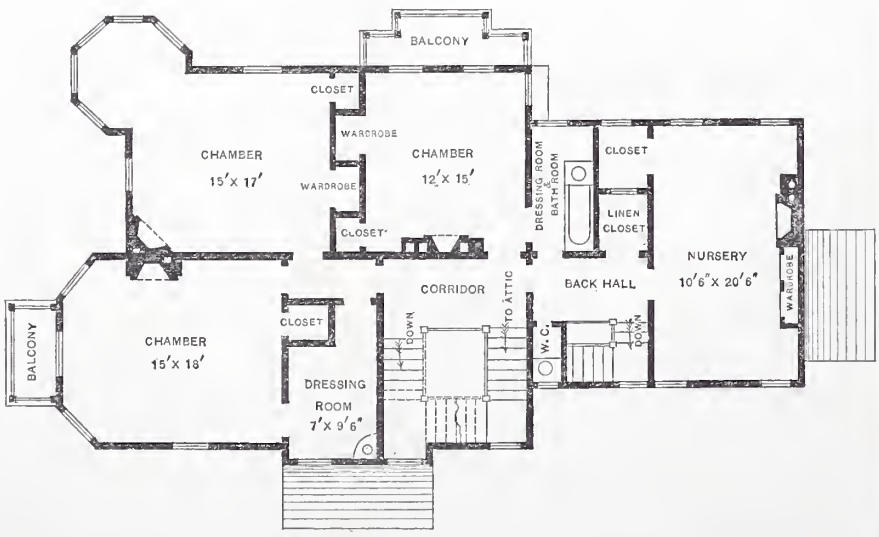
Concerning the decision in this contest, our advertisement said that all the plans received would be put into the hands of a competent committee, who would select the best up to a number not exceeding ten. The plans thus selected were to be published in the February number of the paper, to the end that all our readers might vote in deciding the contest. Each subscriber, it was stated, would be requested to indicate which of the plans published, in his estimation, was the best, and therefore entitled to the first prize. The award of prizes, it was provided, should be made in accordance with the preferences of the patrons of the paper thus expressed. The plans receiving the largest number of votes are to have the first prize; the plan receiving the second largest number of votes the second prize; and the plan receiving the third largest number of votes the third prize. The prizes are $50, $30 and $20 respectively.

In response to our advertisement upward of 200 sets of plans were received. These were submitted to three competent committees, and the final result of their examination is presented herewith. We publish the ten sets of plans which, in the estimation of the judges, are the best of all submitted. The object of this publication, as already explained, is to afford our readers an opportunity of voting in the final decision. To facilitate an expression of choice, there is printed in the advertising pages of this number a ballot or ticket, upon which the choice of each reader is to be recorded. This ticket is to be cut out and mailed to us. As only one ticket is furnished with each paper, it is manifestly impossible for more votes to be cast than the total number of papers published. Hence no injustice can be done to competitors. No votes will be counted except those submitted upon the prepared blanks above described. All votes to be counted must reach us not later than the 20th day of February. Those received after that date will be rejected. The choice of our subscribers, as provided above, is to be simply for the first prize. It is not necessary to encumber the tickets with the choice for the second and third prizes, as we have expressly provided that the set of plans receiving the second highest number of votes shall have the second prize, and the one receiving the third highest number of votes the third prize.

The plan receiving the highest number of votes, and therefore awarded the first prize, becomes the basis of our next competition, the subject of which is the elevations and details of the eight-room house. The prizes in this, our sixth competition, are as follows: First prize, $100; second prize, $60; and third prize $40. The time of closing this competition and the method of deciding between competitors will be announced in our next issue. We annex a brief description of the several sets of plans submitted herewith, condensed from the accounts given by the authors themselves.



Progressive Study in House Building.—Fig. 3.—*Foundation Submitted by No.* 91.—*Scale,* 1-16 *Inch to the Foot.*



Progressive Study in House Building.—Fig. 2.—*Second Floor Plan Submitted by No.* 91.—*Scale,* 1-16 *Inch to the Foot.*

Number 91 says the first floor is laid out so as to have the top of water table 2 feet 6 inches above the grade of ground. The floor is planned with a view to having a cool house in summer and a warm one in winter. Each room can have the sun at all seasons. The hall is light and airy, being open to the roof, with a lantern light under the ventilators in the same. The second floor is laid out with regard to comfort and saving of passage room. The nursery is sufficiently capacious to admit the use of two beds. The water closet is separate from the bathroom.

In describing his plans Number 138 says: I would set the building back 50 feet from the street on the front, and as far from the side street on the south as the surroundings will admit. In planning the house the plumbing has been arranged in such a manner as to best protect it from freezing. The house may be heated by furnace or by steam, at the option of the owner. The main hall is lighted by a window and double glass doors. Windows also open off the walls into the conservatory. A spacious hall is provided in the second story, with three large chambers in convenient communication. The back part of the house is shut off by a single door in the passage-way.

Number 208 says the sitting-room and dining-room, being the principal living rooms of the house, face the south, receiving light and sunshine, making them pleasant in the winter. The position of the chimneys in these rooms is such as to take up little space. All the flues are situated against the inside walls, consequently they retain the heat better than chimneys built on outside walls. The kitchen is on the north side of the house and will proteet other portions of the building from the cold. It is in such a position as to shut off all odors of cooking from the front part of the house. The back stairs open out of the kitchen. The chambers are so planned as to provide several places for putting beds. The bathroom is placed in such a position as to give the greatest security against the frost. The plumbing arrangements generally are very complete. The stair hall is lighted by a skylight.

Number 29 says the main thoroughfare is on the long side of the lot, thereby defining the position of the main rooms. The staircases are placed on the cold side of the house, the living rooms on the south and west. The parlor, sitting and dining-rooms connect, and are separated by draperies, which may be removed on special occasions. In order to more effectually connect the parlor and sitting-room, the space over the mantel shelves is fitted with a broad plate-glass window reaching to the cornice. The inner hall is for those whom it may not be desirable to introduce into the family rooms, and is provided with a seat and open fire-place. The parlor may be finished with a wooden ceiling with corbels and side pilasters. The windows in the piano recess should be 5 feet from the floor, and of stained glass. The sewing-room on the second floor overlooks the landing by a wooden screen, but may be separated by curtains. The water-closet is convenient to bath-room, but is separated from it.

Number 3 says the hall is well lighted by a triple window on the landing, besides the usual transom over the front door. The rooms are intended to be warmed from a hot air furnace, so placed to resist the influence of prevailing winds. The plan of the building is such as to facilitate economical construction. The arrangement of the rooms is such that they may be furnished artistically or very simply, according to the means of the owner.

Number 191 says: Among the advantages of this plan to be enumerated may be mentioned the accessibility to all the principal rooms from the hall, and the partly secluded entrance to the kitchen, the isolation of the kitchen and the convenient location of pantry; the back stairway and cellar way; ample supply of closets throughout the house; provision for fire-places wherever they may be desired; the seclusion of the bathroom, confining the plumbing to the rear part of the house. There is a rear entrance into the main hall, and a water-closet on the lower floor.

Number 6 says: The main features of my plan are, using one chimney stack

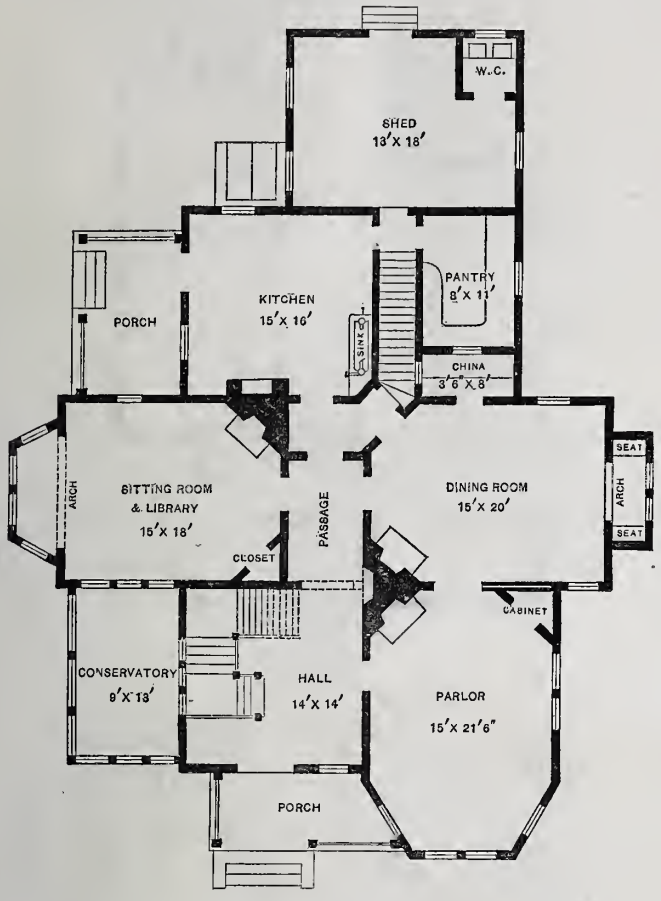


Fig. 4.—First Floor

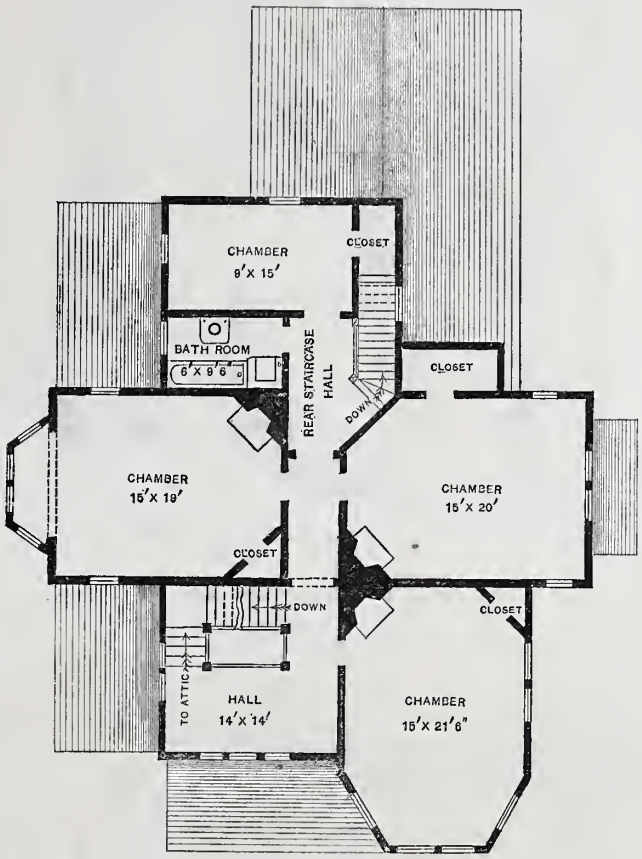


Fig. 5.—Second Floor

PROGRESSIVE STUDY IN HOUSE BUILDING.—PLANS SUBMITTED BY NO. 138.—SCALE 1-16 INCH TO THE FOOT.

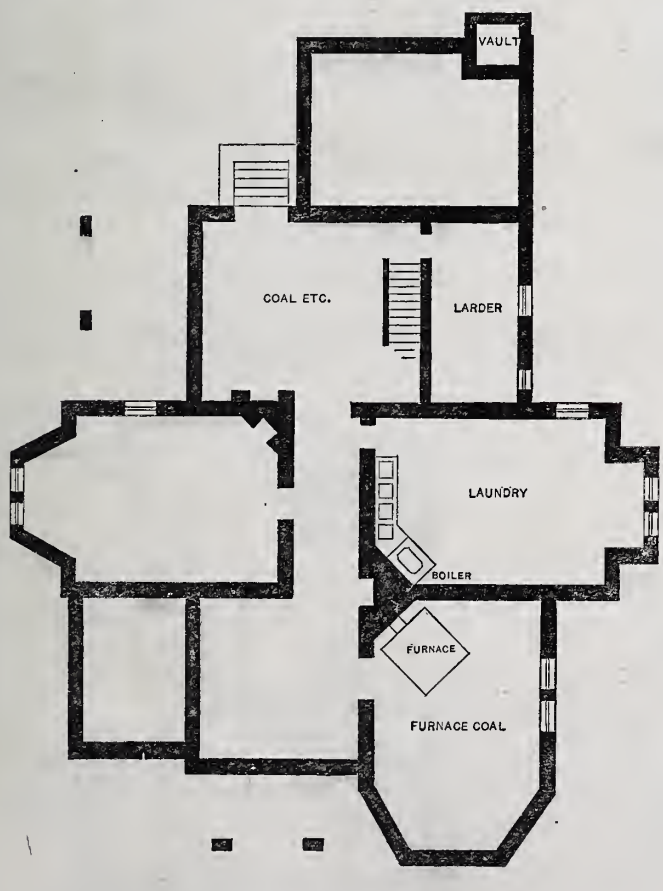


Fig. 6.—Foundation.

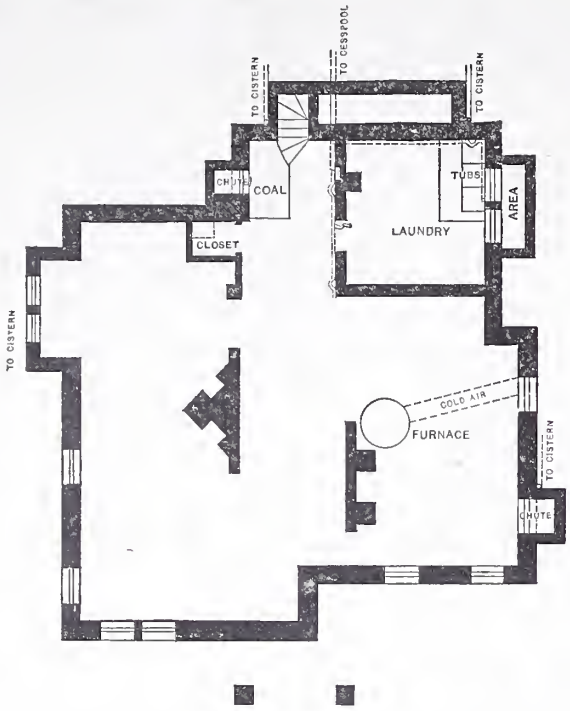


Fig. 7.—*Cellar.*—(*No.* 208.)

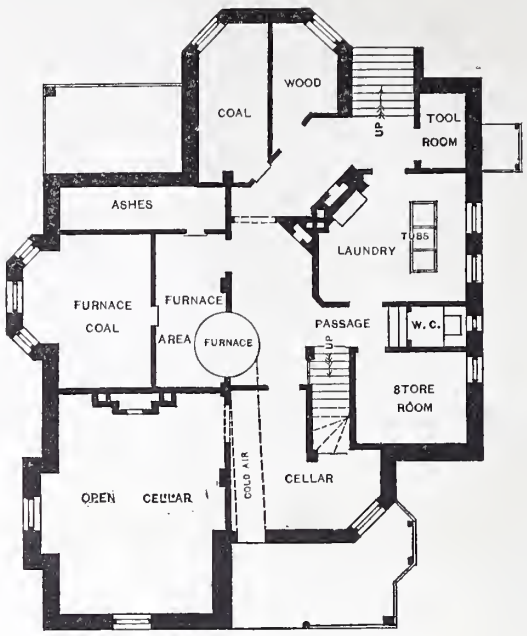


Fig. 10.—*Cellar.*—(*No.* 29.)

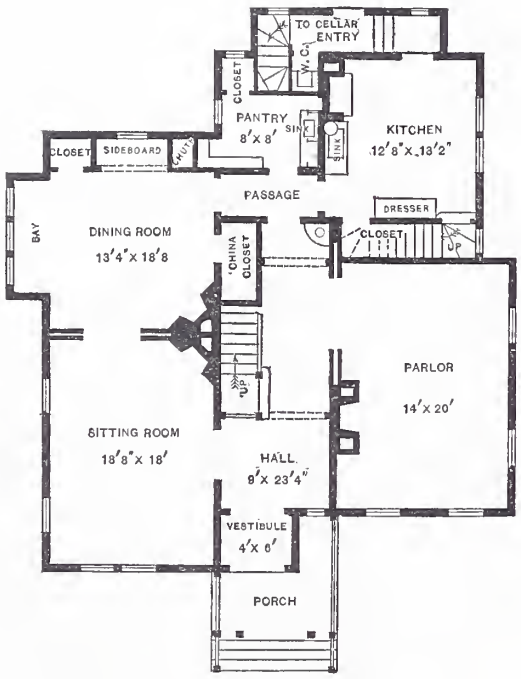


Fig. 8.—*First Floor.*—(*No.* 208.)

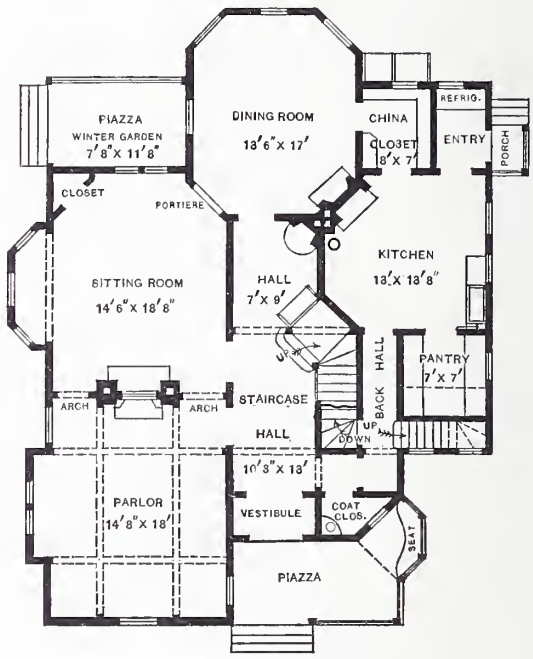


Fig. 11.—*First Floor.*—(*No.* 29.)

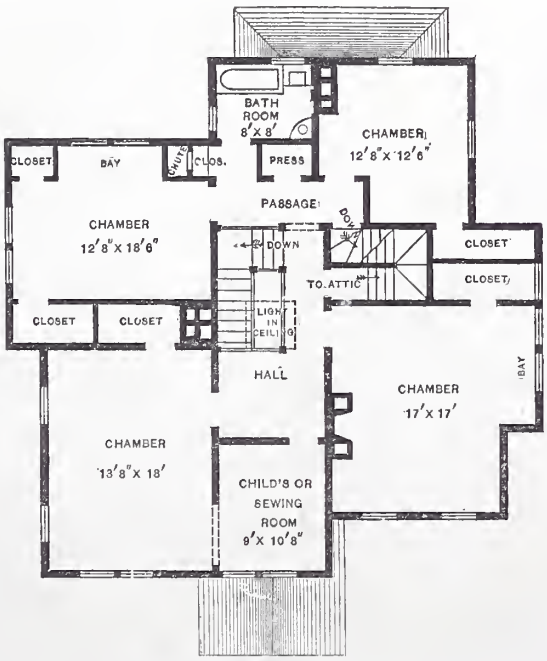


Fig. 9.—*Second Floor.*—(*No.* 208.)

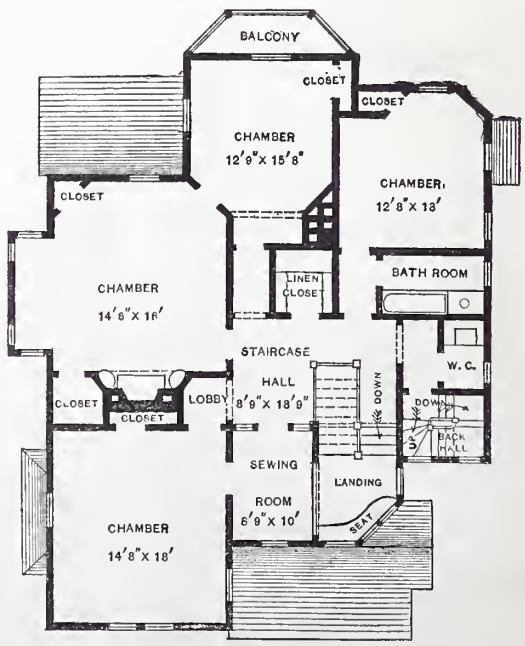


Fig. 12.—*Second Floor.*—(*No.* 29.)

PROGRESSIVE STUDY IN HOUSE BUILDING.—PLANS SUBMITTED BY NOS. 208 AND 29.—SCALE, 1-16 INCH TO THE FOOT.

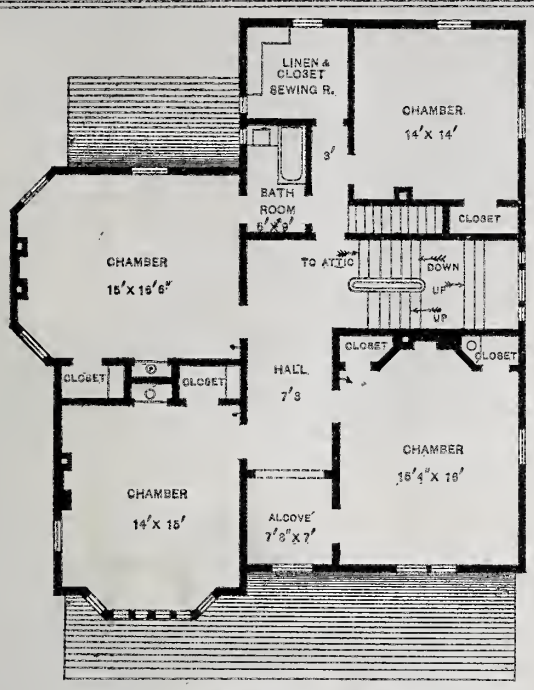


Fig. 13.—Second Floor.—(No. 3.)

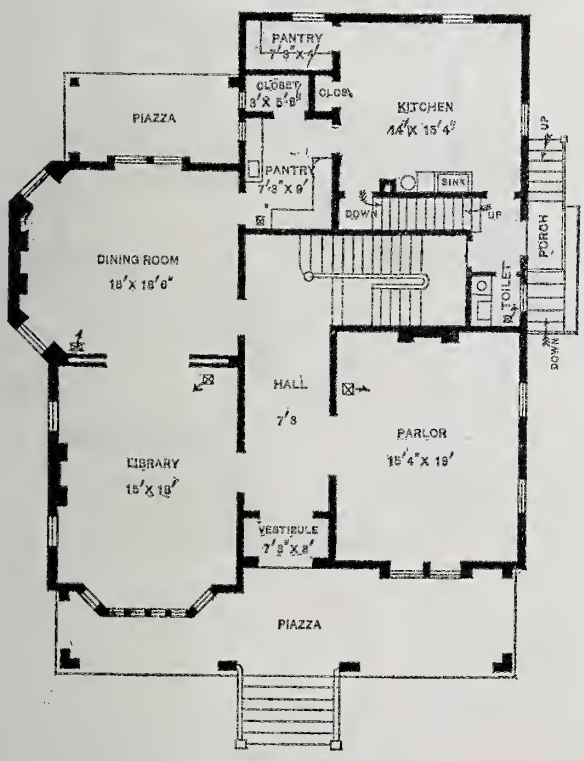


Fig. 14.—First Floor.—(No. 3.)

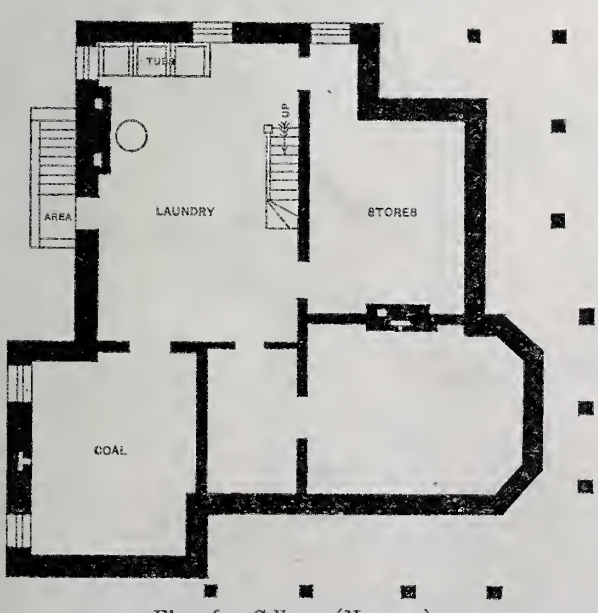


Fig. 16.—Cellar.—(No. 191.)

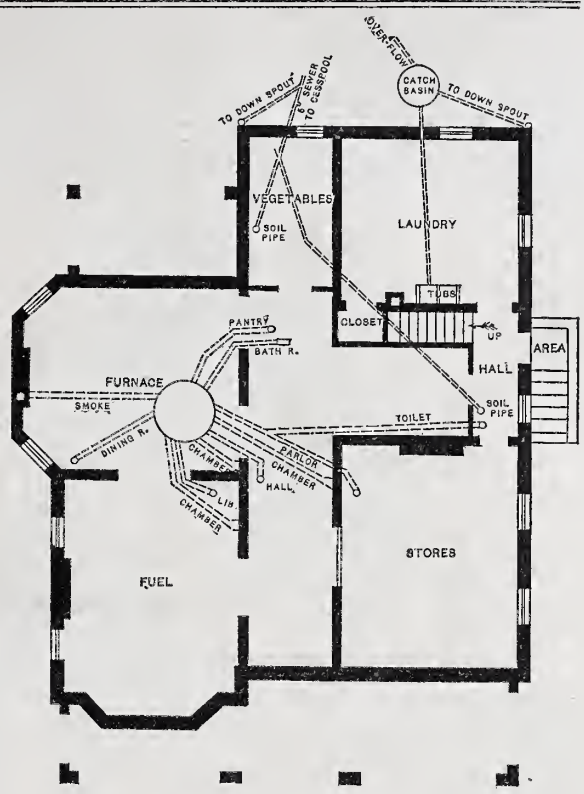


Fig. 15.—Cellar.—(No. 3.)

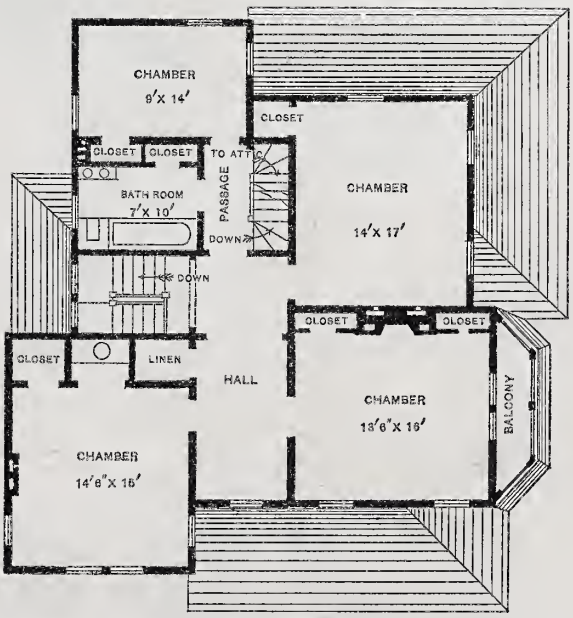


Fig. 17.—Second Floor.—(No. 191.)

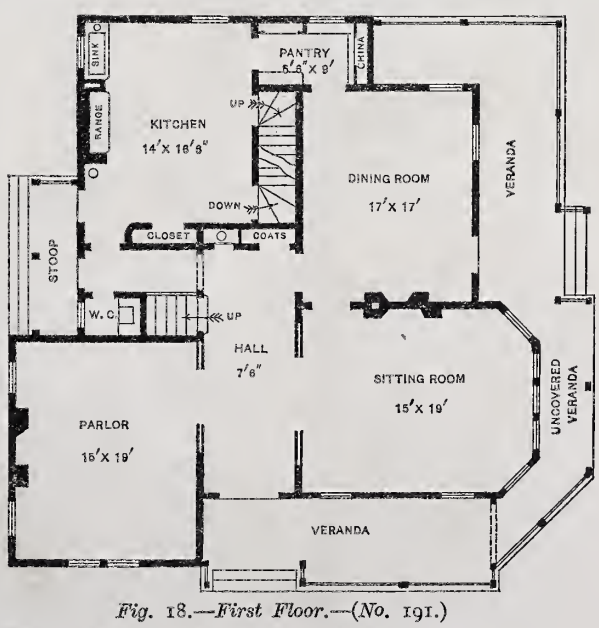


Fig. 18.—First Floor.—(No. 191.)

PROGRESSIVE STUDY IN HOUSE BUILDING.—PLANS SUBMITTED BY NOS. 3 AND 191.—SCALE, 1-16 INCH TO THE FOOT.

for the flues of three grates and a furnace, and combining with it, in the basement, ashpits for the grates. One flight of stairs is made to serve for both front and rear, thus reducing hall room to a minimum. The living rooms have southern exposure. All hot-air flues, with one exception, are carried up in the chimney stack. The plumbing is condensed, and is near the rear, so that one soil pipe is sufficient. Ventilation is insured by carrying the soil pipe above the roof, and ventilating sewer and privy vault into the flue next to that used for the kitchen. Ample provision of closet room is made. There is a minimum of waste room in the plan.

Number 97 says: The arrangement of the rooms in this plan is such as to afford an abundance of closet space. Two entrances are provided, one from the front, and one from the side street. A direct communication to the kitchen, dining-room, and sitting-room is afforded from the side entrance. In the rear hall is a stationary wash-stand, also a dumb waiter running from basement to attic. Alongside the dumb waiter is a shute extending from the attic to the soiled linen closet in the basement, with openings on the several floors. The storeroom and china closet are connected by a slide, through which dishes may be passed for the dining-room. Two entrances to the basement are afforded. The bathroom is heated from the kitchen range upon the same principle as employed in a Baltimore heater. The water-closet is separate from the bathroom, and the entire plumbing is in the southwest corner of the building.

Number 58 says: The advantages which I have endeavored to obtain in the plans I submit are plenty of sunlight; stairs in convenient location; economy in plumbing; thorough drainage and ventilation, and convenient arrangement.

Number 69 says: I have endeavored to introduce all the modern improvements, and, at the same time, have had in view the desirabilty of keeping them plain and substantial, so as to bring the cost of the building within a reasonable figure. In the arrangement of the rooms I have thought more of comfort and convenience than any decided novelty in planning. As far as I know, the arrangement is as original as is possible, considering the number of house plans extant. The vestibule is provided with a closet for overshoes, coats, &c. A side light, plain glass, to the left of the door lights the vestibule. One of the distinctive features of the plan is direct communication from the hall to the three principal rooms, which are also connected with each other. The sitting-room is placed on what is conceived to be the pleasantest side of the house, and is provided with a bay window. Communication between dining room and pantry is through the pantry, or, if preferred, the service may be through a slide which is provided, opening into the kitchen over the sink. The rear hall communicates with three rooms, and contains a closet for servants' use, and also affords room for the refrigerator. A dumb waiter is provided alongside of the range in the kitchen, for bringing up fuel from the cellar. The water-closet is placed outside of the house, opening from rear of porch. Ample room has been allotted to stairways, making them easy of ascent and descent. All the chambers have two closets each, except the rear, which has but one. Means are provided for heating all the rooms from a furnace, and yet fireplaces are provided in the two principal chambers.

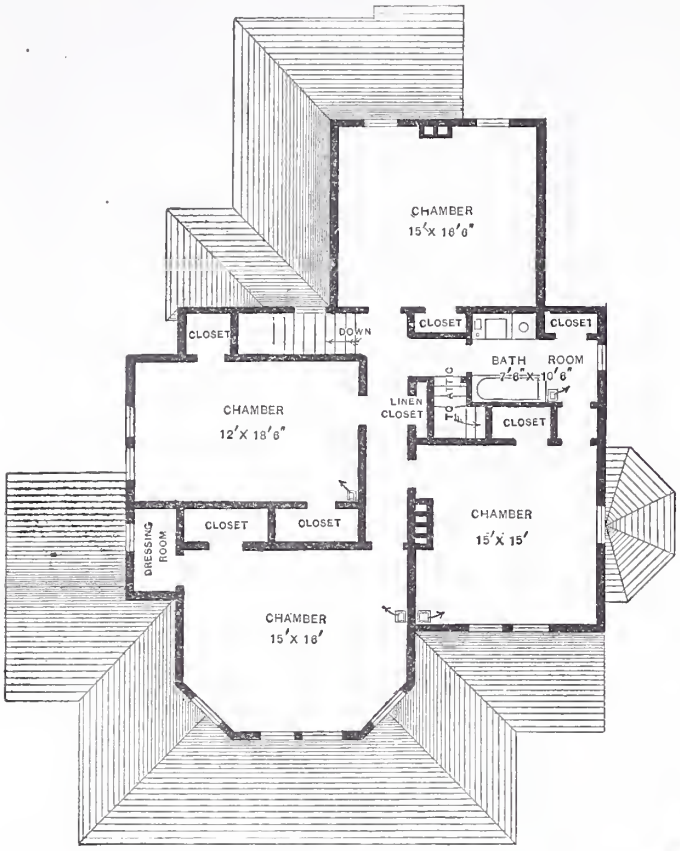


Fig. 19—Second Floor.

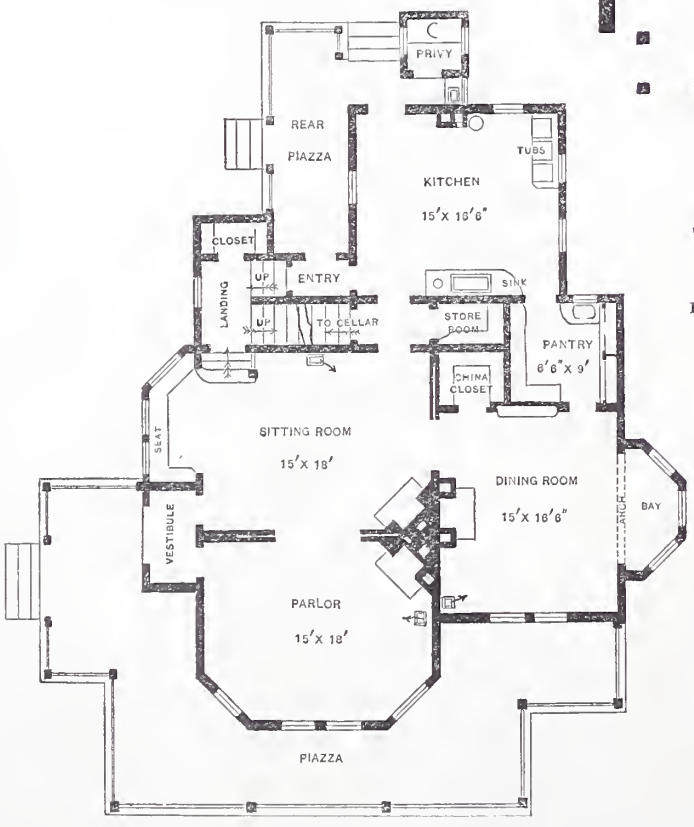


Fig. 20—First Floor.

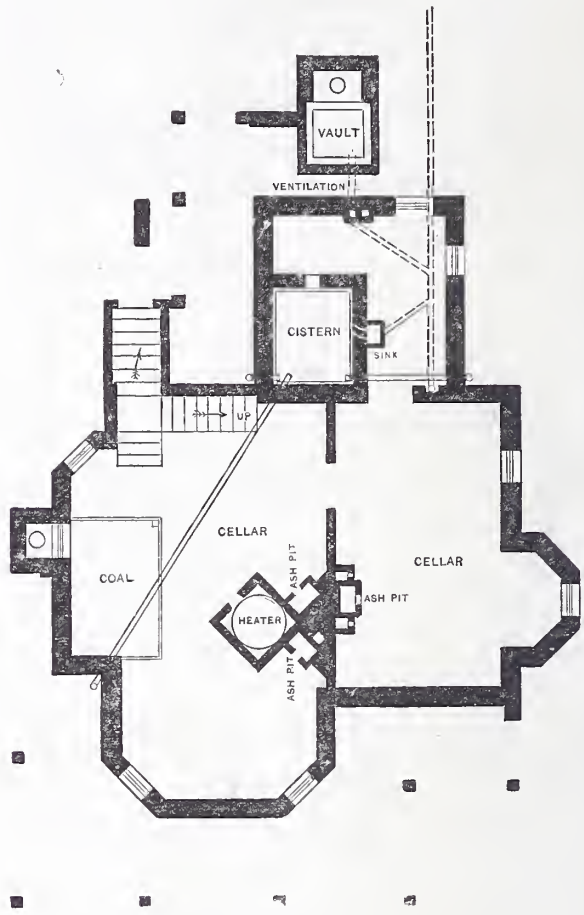


Fig. 21.—Cellar.

PROGRESSIVE STUDY IN HOUSE BUILDING.—PLANS SUBMITTED BY NO. 6.—SCALE, 1-16 INCH TO THE FOOT.

How to Figure Speed—The Reason Why.

One of our exchanges a short time since contained a very plain statement of a simple rule for figuring speed, which we reproduce below. It will doubtless prove of interest to our younger readers:

In selling machinery, the maker usually recommends that it be run at a certain rate of speed which has been demonstrated by experience to be most favorable to its successful operation. To fix upon the relative size of pulleys to be used in communicating this motion from the "line shaft" is a calculation which seems to be very imperfectly understood by the average mechanic. Conversation on the subject with a large number of engineers, millwrights and others has led us to think there was a demand for more light, and we accordingly offer the following system, the convenience and accuracy of which have been proven by years of practical use. This simple example will illustrate: Given, a 20-inch pulley revolving 100 revolutions per minute, how fast will a belt from it drive a 10-inch pulley?

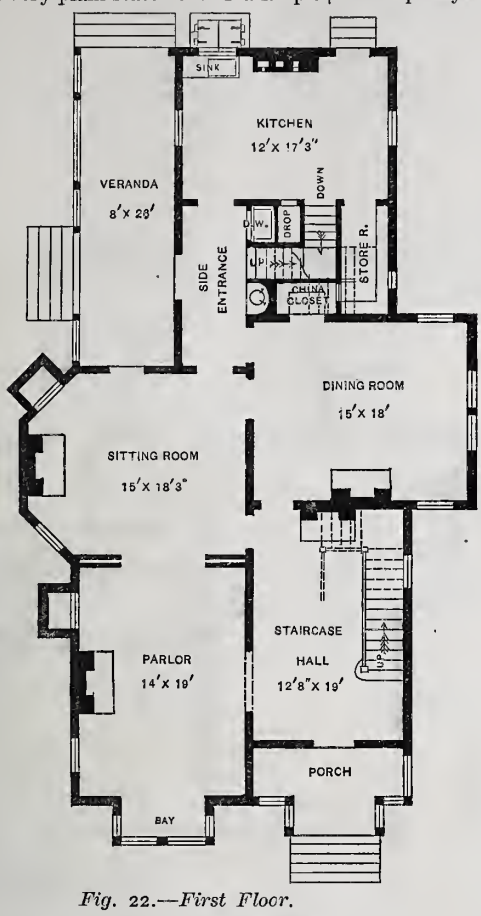


Fig. 22.—First Floor.

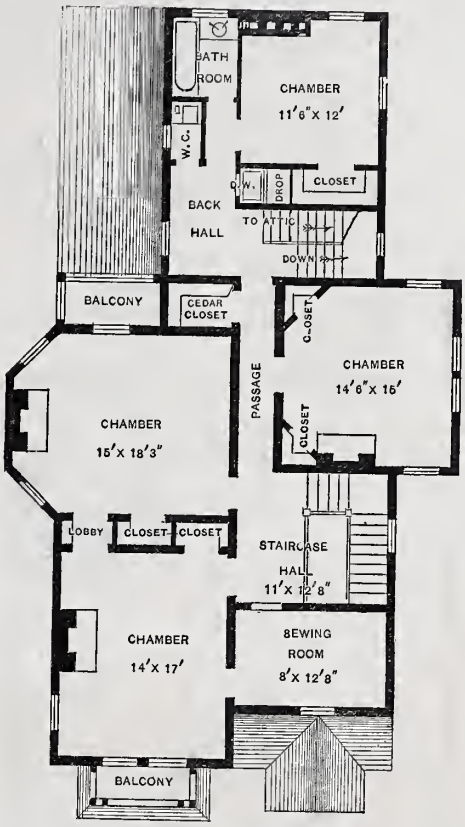


Fig. 24.—Second Floor.

PROGRESSIVE STUDY IN HOUSE BUILDING.—PLANS SUBMITTED BY NO. 97.—SCALE, 1-16 INCH TO THE FOOT.

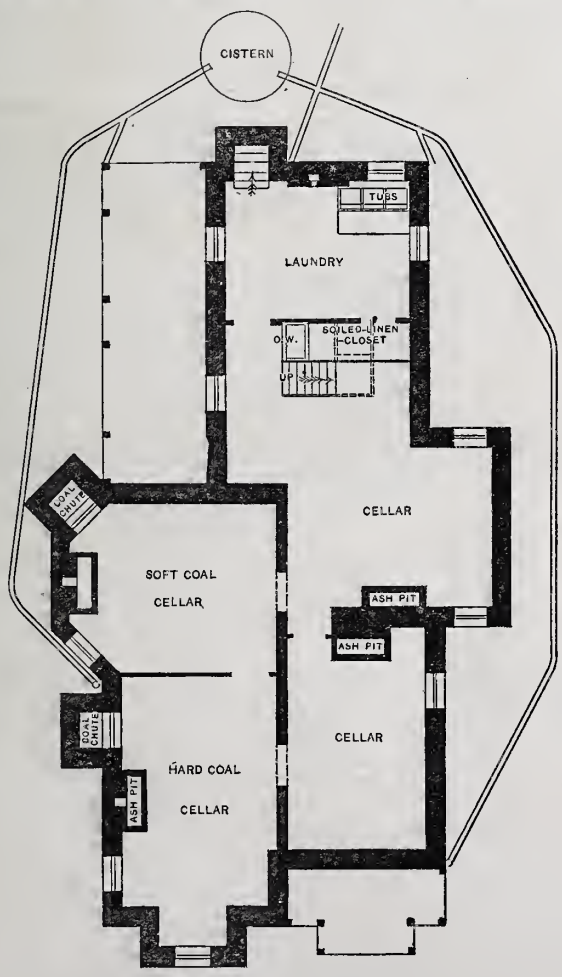


Fig. 23.—Cellar.

The "rule" laid down in the "books" says: "Multiply the diameter of the driving pulley by its revolutions per minute, and divide by the diameter of the driven pulley." I find no fault with this rule, but would suggest that the teacher and text book of the future will be successful in proportion as they abound in "reasons why," and give the student principles from which to form his own rules. As every rule must be based upon a principle, when one is familiar with the latter the former becomes self-evident and not easily forgotten. The speed of a driven pulley will bear exactly the same relation to the speed of its driver as its diameter does to the diameter of the driver.

In the above instance, the driven pulley being smaller, let its size represent the denominator of a fraction, of which the diameter of the driving pulley shall stand as a numerator, thus: $\frac{20}{10}$ of 100 = 200. Or, suppose the diameter of driver was 25 inches, its speed 180, and a speed of 600 was required, what must be the diameter of driven pulley? Reasoning: Since the speed must be greater, its diameter must, of course, be less than that of the driver. How much? As much less as its speed is greater; thus its size will be

$$\frac{180}{600} \text{ of } 25 = \frac{75}{10}, \text{ or } 7\tfrac{1}{2} \text{ inches.}$$

This not only leaves less room for a misstatement of the problem, but in most cases the multiplications and divisions may be made mentally, thus saving time and avoiding liability to error.

These advantages are of still greater importance where intermediate pulleys or "counter" shafts are used to multiply motion. For instance, it is required to "set up" a planing machine, the cylinder of which must run 3500; it has a pulley 4 inches; the counter shaft has pulleys 6 and 24 iuches, respectively; the line shaft runs 160; what size driving pulley will be required? Reasoning: The 4-inch pulley being driven from one 24 inches, the larger pulley will revolve as

much slower as 24 is greater than 4, and the drive pulley on line shaft must be as much larger than the driven or counter shaft, as its speed is slower than that of the counter shaft which it drives. The entire operation may be analyzed as follows: For the sake of clearness, I will suppose that the motion was communicated direct from the line shaft to the 4-inch pulley, in which case the drive pulley must be $\frac{3500}{160}$ of 4, or 87½ inches.

The use of a counter-shaft will decrease the size of driver exactly in proportion to the relative size of its pulleys. In the above instances the pulleys on counter-shaft are 6 and 24 inches; consequently the driving pulley will only require to be 6-24ths as large as when no counter-shaft was used, and this being understood, the whole problem may be disposed of as follows:

$$\frac{3500}{160} \times \frac{6}{24} \times 4 = \frac{175}{8}, \text{ or } 21\frac{7}{8} \text{ inches.}$$

Mechanical Schools.

The criticism commonly made in workshops against the education given in technical schools is that, while the pupils may be first rate draftsmen, and well up in the theory of the mechanic arts, they are utterly unable to do any real work in the shop, not being ready to use the most simple tool or perform the most common labor. The young man is a student, and not a workman. He may be theoretically able to take charge of a machine shop, yet no man will trust him with work, for he would not know whether it were done well or ill. To meet this criticism, the Massachusetts Institute of Technology has opened, in connection with its great school at Boston, a School of Mechanic Arts. Any one can enter this department who can pass an examination in the common grammar school studies. The course is of two years, and the plan of study includes instruction in carpentry and joinery, wood-turning, pattern-making and foundry work in the first year; and iron-forging, vise-work and machine-tool-work during the second year. There is also instruction in the regular schools of the Institute, including algebra, mechanical drawing, geometry, physics and English composition. Four hours a day must be given to study, and three hours every other day must be spent in the shops attached to the institute.

The system of instruction in this school is entirely different from that followed at the Worcester Free Institute or the trade schools in New York. The schoolroom instruction is not important; we wish to see only the shop instruction. The pupils are all taught the use of the same tool at the same time. For instance, in wood-turning there are sixteen lathes, and at each is a pupil working from the same pattern and under the same instructor. In the blacksmith work a number of forges are used at the same time, all the students doing the same piece of iron work at once. The object is to teach manual skill by classes. The articles must be well made, but it is not essential that they have any commercial value. The thing desired is the knowledge of implements and processes, and a reasonable degree of skill in handling the tools and materials. It is not expected that the pupil shall become a high-class workman, as such a degree of skill could only be obtained at the sacrifice of instruction. The graduates of such a school have a knowledge of the more simple tools used in carpentry, iron forging, foundry work, machine-shop work, and pattern making. When they go out to earn their living they are not wholly at sea regarding the aim and use of the tools they see in shops and foundries. They may not be first-rate journeymen carpenters and machinists, but they are advanced beginners, and have a better general idea of the theory and practice of their trade than the average workman in it.

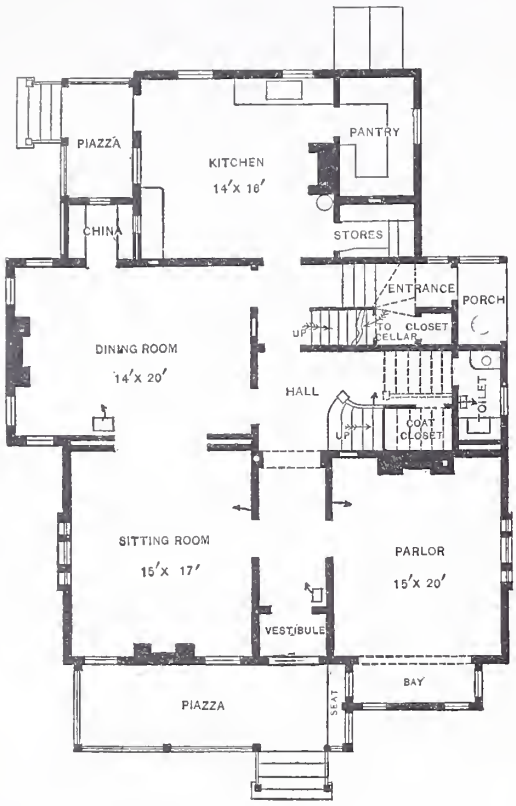


Fig. 25.—First Floor.

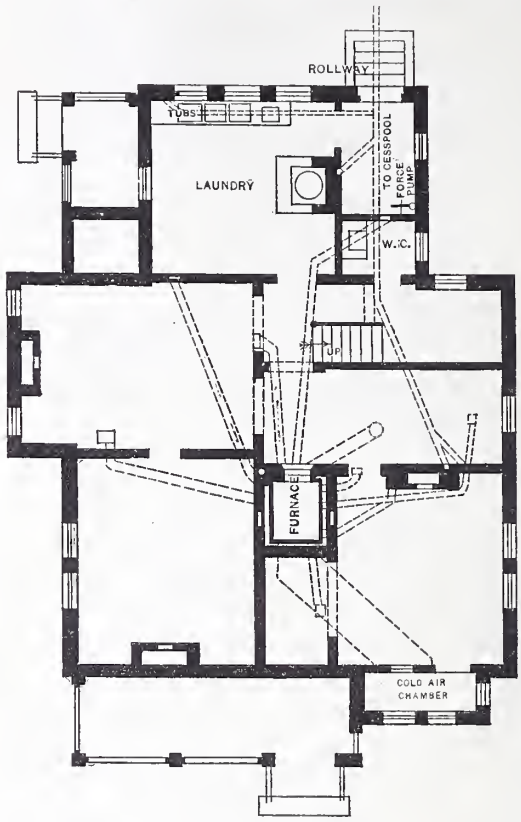


Fig. 26.—Basement and Cellar.

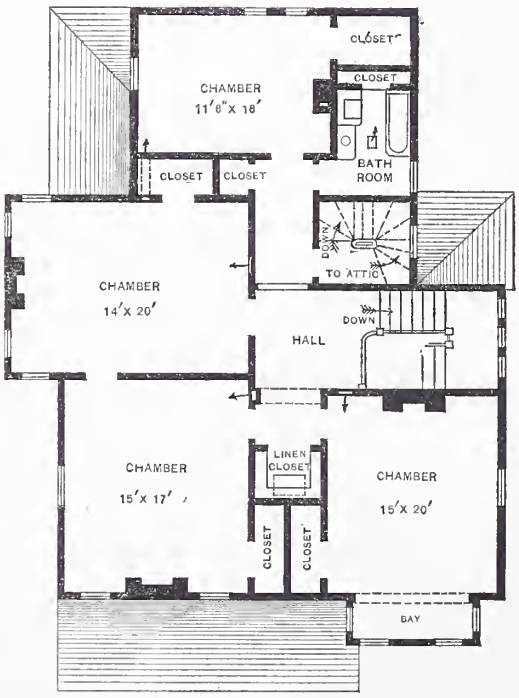


Fig. 27.—Second Floor.

PROGRESSIVE STUDY IN HOUSE BUILDING.—PLANS SUBMITTED BY NO. 58.—SCALE, 1-16 INCH TO THE FOOT.

NOTES AND COMMENTS.

One of the most important jobs of interior sheet-metal finish done in the early days of architectural galvanized iron work, was the ceiling of the Pittsburgh Opera House. This work was put in place nearly 15 years ago by Wm. F. Gebhart & Co., of Dayton, Ohio. It has been frequently repainted in the interval, and is probably in as good condition at present as when first put up. The ceiling of the balcony in the same building was originally done in plaster, but from some defective construction always gave trouble by cracking. This has been obviated lately by substituting for it a sheet-metal ceiling of the kind manufactured by A. Northrop & Co., of Pittsburgh. The peculiarities of this ceiling consist of the manner of making the joints between the panels, and other similar features of construction. The ceiling of the main room was made of galvanized iron. That of the balcony is of black iron, thoroughly painted. No soldering is employed in the latter, while much was used in the former. Perhaps no better contrast could be presented of the changes which have taken place in ideas of construction than is afforded by these two pieces of work. The old ceiling was very expensive, and withal quite ornate. The one of modern construction is simple in all its parts, and instead of being made to imitate stucco work, is honest in appearing to be what it really is. The only features of ornamentation consist of the panels into which the iron is worked by the necessities of construction, and some unpretentious

stamped rosettes, which are made to hide the laps in the seams.

As the supply of hard woods for the mechanical arts and for decorative purposes declines in this country, it is well to know where to look for the means of replacing it. Brazil seems to offer an inexhaustible supply of hard and decorative timber. Within an area of half a square mile, Agassiz counted 117 different kinds of wood, many of them admirably fitted by their hardness, tints and beautiful grains for the finest cabinet work. The *muira-pinima*, or tortoise-shell wood, undoubtedly the most precious wood in the world, is found in large quantities on the tributaries of the upper Amazon, where the water can be easily used as a motive power. Many varieties of beautiful woods, easy rivals of the finest black walnut, are wasted yearly on the Amazon in amounts sufficient to veneer all the palaces of Europe. Maurice Morris, the explorer, believes that with the facilities which the Brazilian Government is ready to impart to enterprising industry, the export of these commodities would yield enormous profits in a short time, while the amount of capital engaged need not be great. It is only necessary that these woods be introduced into the market to obtain a decided preference over those now most sought after in the two hemispheres.

Among the remarkable inventions which great catastrophes like the fire in the Vienna Theater have called forth, is a door devised by a local mechanical engineer intended for use in public school houses, theaters, halls and other places where people congegrate in large numbers. The model contemplates the construction of a door 12 feet high, which is so evenly balanced on pivots in the center that a slight touch on the bottom throws it into a horizontal position, leaving an opening 6 feet high, through which the crowd may pass. In this way it is claimed there can be no jam at the exit owing to the improper swinging of doors or the failure to open them when necessary.

Any one who has visited Philadelphia lately and given its streets a critical examination, must be impressed with the fact that bay-windows are a prominent feature of its house architecture. The practice has been to gain ground by extending these windows over the street line, a permit from the Common Council being easily obtained. A movement has been recently started to protect the public from these rapidly multiplying encroachments, and in a suit to compel the removal of a window which was projected from the second story, the court ruled that a public highway does not mean only the footway or cartway, but all above it. When a street is dedicated to public use it not only gives the right of passage to carts, wagons and foot passengers, but also retains to the citizens the unrestricted right of light, air and view.

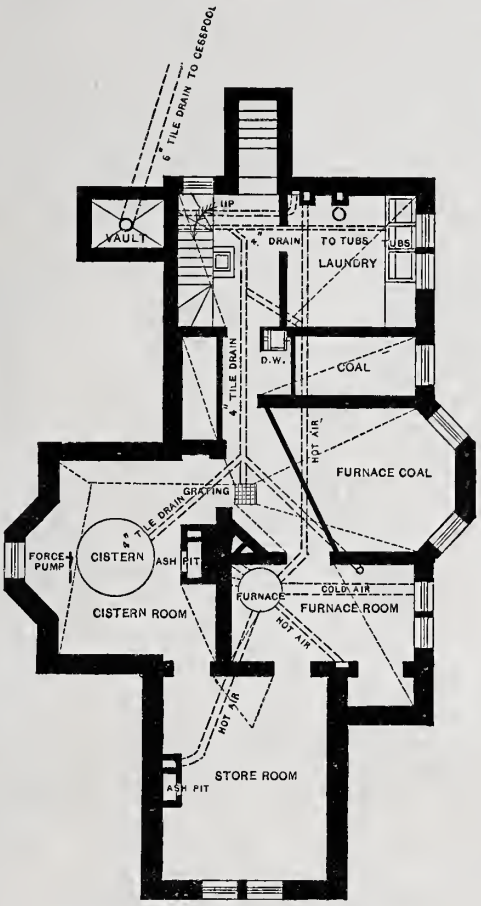


Fig. 28.—Foundation or Basement.

Slate is a material which for building purposes has many most valuable qualities. It deserves much more attention than it has hitherto had. Although used extensively for table tops, fire-places and many other things of that kind, it is capable of a much wider introduction. It has great strength, and it is said might be used for various architectural purposes. It can be sawn or worked into shape almost as easily as wood and by very similar tools. It takes a fine surface, and when not exposed to violence will endure for ages without deterioration. It is completely impervious to water, and on this account can be used to great advantage for damp courses and for lining rooms, either to keep out or retain water. The number of colors in which it is found is limited, but most of these are very desirable. It can be had in purple, red, green, variegated and black.

For fashionable furniture, mahogany is now more in use than any other wood. Its fine color, strength and durability have much to recommend it, while its continual increase of beauty as it grows older makes it doubly valuable. It is undoubtedly the coming wood for furniture and cabinet work. We may, however, shortly expect to see many other of the beautiful tropical hard woods introduced to compete with it. Amaranth and Cocobola woods are both used to some extent by the manufacturers of the finest furniture, and for some work they are using oak. The Australian blue gum-wood may perhaps come into the market for the same line of uses. Cherry, and even birch, are sometimes used to imitate straight-grained mahogany. They can be made to assume the color perfectly, and as they are hard and durable, they are much liked when the more expensive wood cannot be afforded.

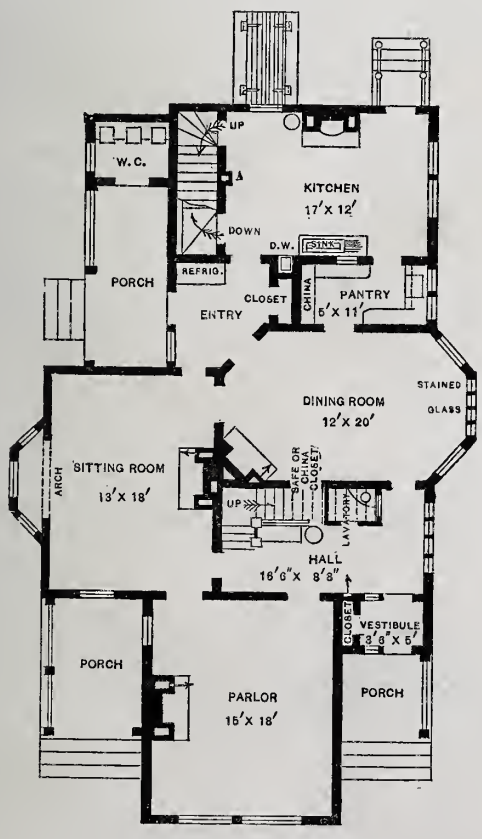


Fig. 29.—First Floor.

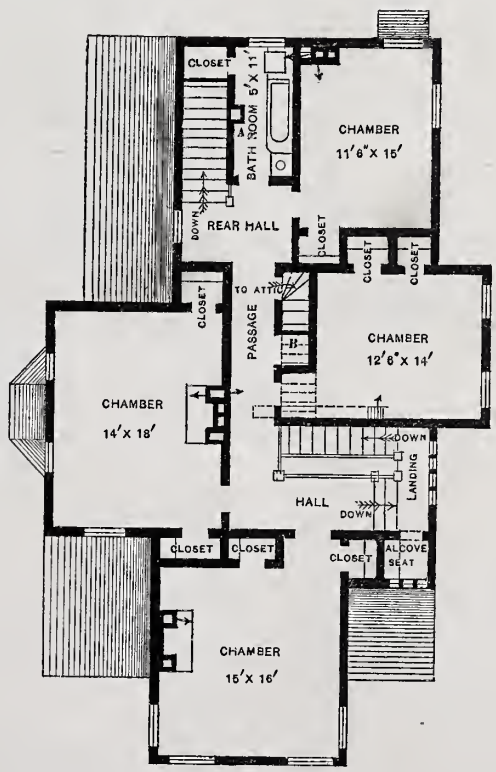


Fig. 30.—Second Floor.

PROGRESSIVE STUDY IN HOUSE BUILDING.—PLANS SUBMITTED BY NO. 69.—SCALE, 1-16 INCH TO THE FOOT.

A NEW PROCESS by which ordinary wood has imparted to it the appearance of walnut suitable for office, steamboat and other cabinet work, has been recently described. Birch, beech, alder or similar woods are first thoroughly dried and warmed, then coated once or twice with a liquid composed of one part by weight of extract of walnut peel, dissolved in six parts of soft water, by heating it to boiling and stirring. The wood thus treated is, when half dry, brushed with a solution of one part by weight of bichromate of potash in five parts of boiling water, and, after drying thoroughly, rubbed and polished.

IT IS ON RECORD in Germany that in the past 272 years no fewer than 523 theaters have been burned down in various parts of the world. This is an average of nearly two per year. During the past century this was a large increase in the percentage over the preceding time. For the hundred years the total number was 460, more than four-fifths of the total for the 272 years. For the period included between 1871 and 1878 the average was 13 per annum. Some of the minor features of these statistics are as follows: Of cities, London, with 31 fires, leads the list; Paris, with 29, follows her. Then comes New York with 26, then San Francisco with 21. While Barnum's place of amusement in New York has been so ofteu burned down, Astley's in London and the Grand Opera in Paris have each been destroyed four times. Her Majesty's, Drury-Lane, and Covent Garden have been three times burned. Numerous other London theaters could boast of two serious fires. On the Londou list the oldest theater conflagration is the Globe's, on Bankside, which was destroyed in 1613.

THE ADVANTAGES of using both hands with equal facility are usually much underestimated. A child who naturally uses the left hand as easily as the right undergoes a systematic training to teach it to neglect the left hand entirely. If a knife is taken up in the left hand he is at once cautioned to put it dowu and take it up in the "proper way;" thus the few cases in which nature attempts to give equal facility to both hands are ruined. In many mechanical operations the ability to use the left hand as easily and skillfully as the right is of almost incalculable benefit. In mechanical drawing the work of shading cylindrical forms with a brush can best be done when a brush is held in each hand. In this way gradations are obtained with a speed and perfectiou quite beyond the reach of a person who works with a single brush. It is not difficult eveu for grown people to acquire considerable skill in the use of the left hand if they pay attention to the matter, and the knack of carrying a brush in both hands, or of using the drawing pen in the left hand, where the requirements of the work make it desirable, is easily accomplished.

THE WILLIAMSBURGH SHORE of the East River, just opposite the central portiou of New York City, was the scene of a disastrous conflagration a few weeks since. A sugar refinery was destroyed, resulting in a loss of between $1,500,000 and $2,000,000. The fire was noteworthy, not only for the great damage it did, but also for the evidence it afforded of the inadequacy of the most essential provisions to check the spread of fire in that neighborhood. There were fire engines enough, well manned and directed, but, as has been the case in other instances, the water supply was insufficient. This fire also added another instance to a long catalogue of proofs that where the owners of factories provide appliances on their own premises to extinguish fire they waste their money, unless they also keep their workmen continually instructed how to use them.

THIS FIRE should have many valuable lessons for all manufacturers. The building which was burned was very old, and had been used in the old process of making sugar in molds. The high heat theu necessary in the drying-rooms had thoroughly dried the building, and made it little better than a tinder-box. It was therefore not to be wondered at that it was a total loss. On the opposite side of the street was a large building eleven stories high, said to be perfectly fireproof. In spite of its supposed fire-proof character it was on fire, however, and cost the department nearly an hour's work before it was extinguished. Its whole front was provided with iron shutters, but, ridiculous as it may seem, these shutters were all of them set in wooden casings. The great heat from the fire on the other side of the street set every casing burning furiously. The roof also took fire, and the fire worked through upon the inside of the windows in two or three stories. Had the wind been high and the department been required to fight upon a longer line, it is quite probable that one or two floors of this fire-proof building might have been burned out. Fire-doors and shutters in wood casings are too absurd, one would think, to be tolerated by intelligent men. They are, however, to be found in a vast number of factories. Where it is difficult to replace them with iron, or to set the doors in such a way that they are protected by the masonry, the wood ought to be covered with tin or sheet iron, and they should be nailed fast in such a way as to prevent the iron from exposing the wood, though the latter might be charred to a considerable depth. Iron fire-doors ought, in all cases, to be completely cased, not only upon the sides, but upon the edges, so that the fire can have no access to the wood.

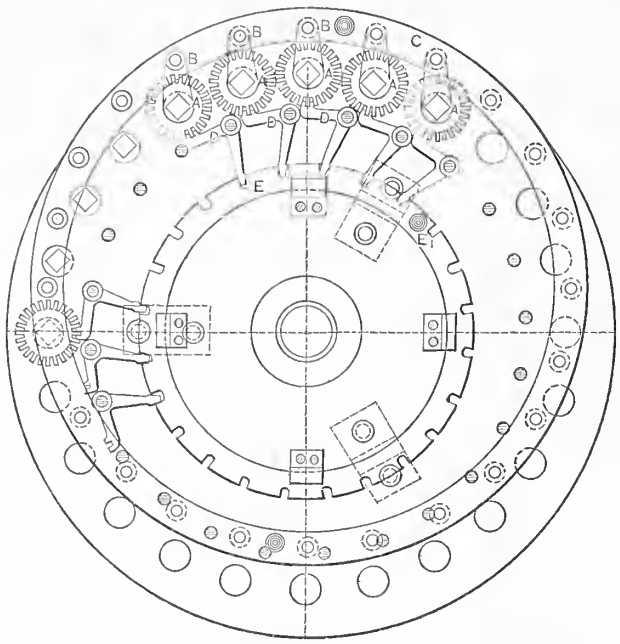


Fig. 1.—Elevation of Face Plate.

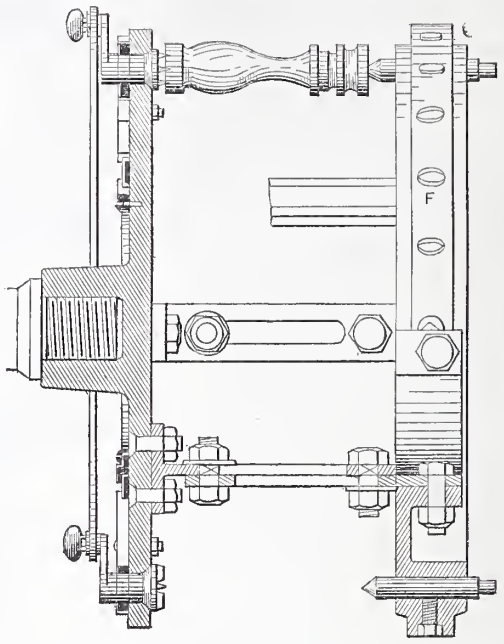


Fig. 2.—Vertical Section.

CHUCK FOR TURNING POLYGONAL FORMS.

Chuck for Turning Polygonal Forms.

A new chuck for turning polygoual forms has been in use for some time past in the establishment of Messrs. Ziergiebel & Co., of Berlin, Prussia, which in priuciple and construction possesses some peculiar features. A method of producing work of this kind which is in use in various establishments, is to fasten the pieces of wood to the circumference of a drum, and in this manner to turn them upon a lathe. This plan necessitates chucking the several pieces as many times as there are sides to the polygons to be produced. The object of the de-

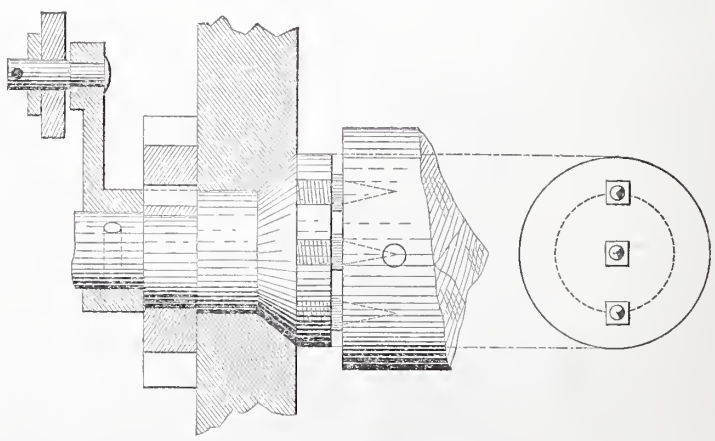


Fig. 3.—Detail showing Method of Fastening the Pieces to the Spindles.

vice we illustrate, and which is an invention of a Mr. Schumacher, is to facilitate the turning of the pieces above mentioned. The sides of the polygons turned in this way are not quite flat, but slightly curved, which, however, can scarcely be noticed, and does not mar the effect.

The chuck consists of a face-plate, Fig. 1, containing bearings for a series of spindles, A, arranged near the outer edge, at equal distances from the center. These spindles are each fitted with a spur-wheel, keyed upon them, and a crank, B, let into their square ends and pinned, Figs. 3 and 5. All the crank-pins of the cranks are coupled together by a single ring, C, and each spindle is also kept in position by a pawl, D, catching into the teeth of its spur-wheel. These pawls are of a bell-crank shape, as shown, and the other ends are held in the notches of a ring, E, which is kept centrally with the face-plate by four guides, and fitted with a handle, E_2, so that by moving this ring all the pawls can be withdrawn simultaneously out of the teeth of the spur-wheels and reinserted.

All the cranks B connected by the wrought-iron ring C, in parallel positions with each other, must follow simultaneously the movement of the ring C after the pawls are withdrawn. The wood blocks held by the spindles participate in this movement, and are thus revolved on their axes all together, according to the divisions adopted. The number of teeth of the wheels is in the present case 24, which allows 3, 4, 6, 8, 12, and 24 cornered forms to be turned by the chuck, by moving the wheels by 8, 6, 4, 3, 2, or 1 tooth after each side has been completed.

Each wood block is previously centered, having on the face-plate end either three center marks or two cross-grooves, according as the spindles are fitted, with three points, as Fig. 3, or with cross edges, as Fig. 4. The other end has simply a center punch. The blocks are driven up by blows with a mallet upon the sliding center points contained in the lock-ring E, after which the sliding centers are fixed by means of set-screws. The blocks held in this way are forced to participate in the simultaneous movement of all the spindles. To accommodate various lengths, the lock-ring, or following headstock, as it may be called, is attached to the face-plate by three or more wrought-iron brackets and sliding-plates provided with slots and bolts, so that it can be fixed at varying distances from the face-plate. The arrangement will

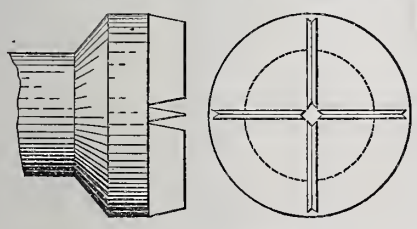


Fig. 4 —Another Method of Constructing the Spindles.

be clearly understood from Fig. 2. Short lengths may thus be turned on the face-plate only; but for long lengths a cross-piece fitting into the lock-ring has to be attached and supported by the center of the loose lathe headstock, as otherwise there would be too much overhanging weight on the lathe spindle, and too much vibration in turning the outer ends of the wood pillars. Instead of using the cranks B and connecting ring C for revolving the spindles simultaneously, an external or internal spur-wheel, in gear with all the small spur-wheels, might be used, which we should consider a better arrangement, as there would be no eccentric weight on the face-plate, which is the case with the arrangement shown. For turning, either a stationary tool fixed on the slide-rest, or a rotary cutter revolving at high speed, as used in wood-copying lathes, may be employed. The easy method of revolving the spindles allows different parts of the pillars to be formed with different numbers of sides to them, or, if care is taken in centering them, portions may be turned round, first in an ordinary lathe, then the other parts polygonally on the chuck described. For instance, a pillar may be turned with a square plinth, round base, 12-sided shaft, round capital and square plate. The chuck thus offers great facilities for producing a great variety of ornamental joiners' and cabinet-makers' work, and will no doubt interest many of our readers.

STRAY CHIPS.

There was unprecedented activity in the building trade in New York City during the last year. The present year is likely to be almost as busy and promises well for architects, builders and mechanics. The largest amount expended during 1881 was in the construction of first-class dwellings, the figures being upward of $18,000,000. After first-class dwellings came flats and apartment houses, this item figuring over $9,000,000. Tenements with stores have cost over $4,000,000. The estimated cost of the different buildings for which plans were sent in to the Department of Public Works during the first six months amounted to as much as the whole business of the previous year, and was something over $29,000,000. During the last 6 months of the year the number of plans filed has not decreased in number materially, but there has been a decided change in the estimated cost. The total expenditure for the year amounts to almost $48,000,000.

The Phœnix Planing-Mill at St. Louis, which was burned some time since, is being rebuilt as fast as possible. This mill had a large country trade in addition to its city business. Mr. George Breckenridge is proprietor and manager.

Among Southern hotels built during the last season was a building 110 by 115 feet in plan, three stories high and containing 70 rooms. It was built by Alexander McDougall, contractor, at Tallahassee, Fla. A court house to cost $15,000 is to be built this season.

A new elevator is to be erected in East St. Louis with a capacity of 900,000 bushels. The plans are already made and contracts let. The building will be 175 feet high.

During the present winter the St. Sauver Hotel at Bar Harbor, Me., which was burned some time since, is being rebuilt on a larger scale than formerly. It is expected that it will be ready for guests the coming season.

It is expected that the season at the Olympic Theatre in St. Louis will close early in April, at which time the present structure will be torn down to make way for a new building. The new Olympic is expected to be a model of safety, convenience and beauty.

Joseph Balsley, architect, of Seymour, Ind., prepared the plans and superintended the erection of a $12,000 hotel at Seymour. Four business blocks, costing some $11,000, and five handsome residences, costing $18,000, to designs prepared by the same architect, have also been erected in the same place. Also a schoolhouse costing $6000.

The St. Louis Asphalt Paving Co., who have been in operation some two years, have achieved a marked success, and contemplate enlarging their producing capacity. Over one thousand car loads of their paving blocks were shipped to Chicago in the past two months, and large quantities have been sent to other places.

Building operations in Chicago during the year 1881 are reported to have amounted to $11,500,000.

Miss Jesse Lindell has just finished a five-story stone front store at the corner of Sixth and St. Charles streets, in St. Louis, at a cost of $20,000.

There is a very fine dwelling-house in Waukesha, Wis., that is finished throughout in sweet gum. It has not the red appearance of mahogany. nor the dark, somber cast of black walnut, but strikes the agreeable medium between the two. There are several houses finished with this kind of wood in Milwaukee, with splendid effect. It should be done with oil finish, which fully brings out the grain of the wood, and gives fine effect to its color and quality. It would seem that the country is yet quite well supplied with finishing woods, despite the growing scarcity of walnut.

The large warehouse and stores of the Greeley Burnam Grocer Co., of St. Louis, which were burnt some eight months ago, have been rebuilt at a cost of $45,000.

Menden, Mich., built some very nice blocks during the summer of 1881, and that the tide of improvement has not turned in that town is evident by the fact that a large block, 74 by 135 feet in plan and three stories in hight, is to be erected the coming season. This block combines a hotel and an opera house within its walls. Mr. Frank Pomeroy, builder, will have charge of the improvement.

A new watering place is to be inaugurated next season at a place called Montesano Springs, twenty miles south of St. Louis, on the Iron Mountain Railroad. A fine hotel has just been completed and is now being furnished ready to open early in February. Mr. Charles E. Illsley, of St. Louis, is the architect.

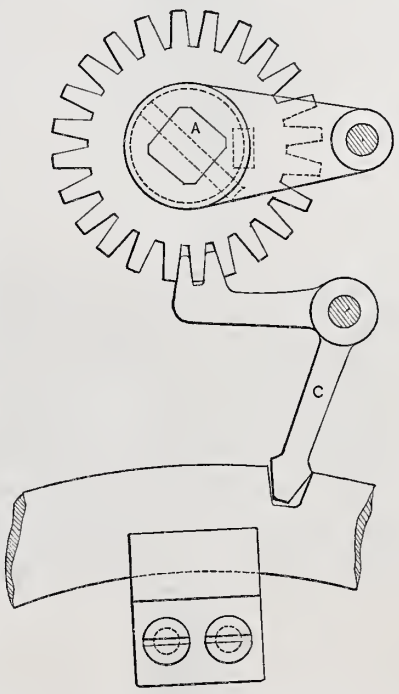


Fig. 5.—Detail of the Parts shown at A, B and C of Fig. 1.

That the Western country is not behind the East in the evidence of substantial prosperity is witnessed by such facts as the following: In the town of Walla Walla, Washington Territory, during the last season, there was built and furnished a new court house at a cost of $60,000. The building was put up of brick and has a handsome external appearance, being at the same time substantial.

The Belcher Sugar Refining Co., of St. Louis have just completed an extensive addition to their buildings at a cost of $125,000. This is one of the oldest and most successful enterprises of this city.

The Carpenters' Unions of St. Louis have united in establishing an Employment Bureau to facilitate communication between employers and journeymen. Their headquarters are at No. 122 North Third street, where they have a reading room for the benefit of their members. This is a sensible move, and it is to be hoped that its success may be such as to encourage enterprise in the same direction in other cities.

The Laclede Gaslight Co., of St. Louis, have just completed a new holder, 150 feet diameter and 60 feet deep. The cost was $125,000. A new tank of about the same size was built by the St. Louis Gas Co. three years ago.

The Missouri Car and Foundry Co., of St. Louis, are building a brick addition to their foundry at a cost of $3000.

Management and Use of Ropes.—I.

There are few mechanics in any branch of business who do not find it necessary to use ropes for various purposes. In a great many places human life depends upon the care and skill with which they are handled. Many subscribers have from time to time asked questions in regard to splicing, knotting and taking care of ropes, and we have determined to give in a series of articles the information which at first we intended to put into the

Fig. 1.—The Twisting of a Right Handed Rope.

shape of answers to queries. We shall at the same time add such matter as seems to be necessary and important in this connection.

Ropes are divided into several classes, according to the method in which they are made or twisted. In general, the yarn from which the strands of a rope are spun is twisted from the right over to the left, thus making the yarn itself right-handed, as it is called. The strands which are formed from the yarns are twisted in the opposite direction, so as to be left-handed, while those in turn are twisted together so as to make the rope right-handed. This we have attempted

Fig. 2.—A "Shroud" Laid Rope. Four Strands, with a Core or Heart.

to illustrate in Fig. 1. Such a rope as this is called by sailors "plain-laid" rope. Sometimes, even in small ropes, four strands instead of three are used, and the rope is called "four-stranded." Such rope in the small sizes is somewhat smoother outside than plain-laid rope. When it is larger it is made with a core or heart, as is shown in Fig. 2, and is by sailors called "shroud-laid."

These ropes are often laid up into a larger left-handed rope. This makes what is called a cable-laid or hawser-laid rope. This is shown in Fig. 3. In England, "hawser-laid" is applied to ropes laid in the manner shown in Fig. 2, and "cable-laid" to a left-handed rope made up of three hawser-laid ropes like that shown in Fig. 3. This is probably the correct way of naming them. There are many other kinds of rope, some of which, like the bell cords of cars, are made by braiding. These latter are very strong, but are not easily spliced, and, so far as we know, are only joined by knots or metallic coup-

Fig. 3.—A Cable or Hawser Laid Rope.

lings. Probably they could be spliced, but we do not know how it would be undertaken. It is well to note that right-handed ropes coil "with the sun," and left-handed ropes in the opposite direction or "against the sun."

When we make use of cordage of any kind

Fig. 4.—One way of Securing the Ends of a Rope by Whipping or Serving.

of course the ends require protection, to prevent them from untwisting and becoming frayed and unserviceable. To secure the end of a rope properly, then, is the first thing that demands attention. The most natural fashion of doing this is to simply tie an overhand knot and jam it fast. This may prove effectual, though the untwisting of the ends beyond the knot and the liability of the knot

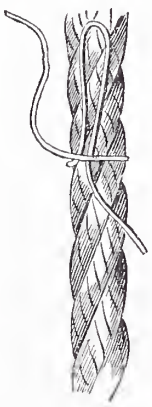


Fig. 5.—Manner of Laying the Twine in Commencing to Whip or Serve the End of a Rope.

to slip when first made, render it somewhat unsafe. Usually, too, a knot of this kind in the end of a rope is inconvenient. If intended to prevent the rope from going through a hole, it has the additional disadvantage of not forming a square shoulder.

Fig. 6.—Passing the Free End of the Twine Through the Loop.

The simplest method of making the end of a rope secure is by whipping or "serving," as sailors sometimes call it, with twine or waxed thread, according to the size of the rope. This, if well done, is a serviceable method. One method which is pretty generally known is shown in Fig. 4. The end of a rope, when whipped, has this advantage—that the end will pass through any opening which will admit the rope itself.

There are several methods of whipping, some of which, under the name of "lash-

Fig. 7.—The Loop Pulled Down Beneath the Turns.

ings," are useful for other purposes. In Fig. 5, we show how the twine is to be laid in commencing to whip or "serve" the end of a rope. One end forms a loop along the rope; the twine is then carefully wrapped around and drawn "taut." When the

Fig. 8.—Manner of Securing the End of the Twine when the Winding is Finished.

whole space has been covered, the free end of the twine is passed through the loop as shown in Fig. 6. Then, by pulling on the end, the "bights" or loops are pulled down beneath the turns, as shown in Fig. 7. The loop, of course, is under all the turns.

Fig. 9.—Another Method of Whipping or Serving the End of a Rope.

In Figs. 8 and 9 another method is shown. The twine is laid along the rope and the winding begun at once. When completed to within half a dozen turns of the end, a piece of twine is looped and laid down on the rope and the turns taken over it. When the

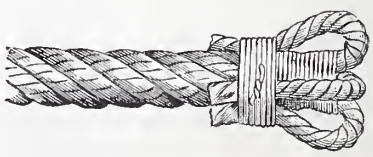


Fig. 10.—A Method of Finishing the Ends of very Large Ropes.

winding is finished, the end is passed through the loop, and then, by pulling, the end is drawn through so as to appear in Fig. 9.

Fig. 10 shows how the ends of very large ropes are sometimes finished. Here not only are the large strands wound or served, but the rope itself is secured in the same manner. Finally, the strands are turned

over and whipped down upon the main or "standing" portion of the rope.

In Fig. 11 we give a sketch of a whipping which is useful when a rope has a great deal of hard usage, like that of a fall and tackle, and in ordinary whipping is likely to come off. The whipping is made in any of the ways we have shown, and then the ends are

Fig. 11.—A Whipping very Useful Upon Ropes having much Hard Usage.

passed around the whipping between the strands. To do this in the most convenient manner, an extra loop like that shown at *x* in Fig. 6 should be used to take one of the ends down the center after coming upon the outside. This method, by forcing the turns of the twine down into the space between

Fig. 12.—Rope Unlaid Ready for Securing the End.

the strands, makes a much more secure piece of work than can be made in any other way. Men who make a business of moving safes in cities have to coil and uncoil their ropes and rig them through blocks oftener even thansailors. To protect the ends of their most important ropes they not only use

Fig. 13.—Interlacing Commenced in one Direction.

the whipping, which we illustrate, at the ends, but put on another just like this about 6 or 8 inches from the end of the rope. A whipping of this kind is best put on with a sailmaker's or bagging needle.

Figs. 12 to 18 inclusive, show how the end of a rope may be secured in a very neat manner without enlarging it. This is done by untwisting the strands, or "unlaying," as it is called, for a short distance. When this is done it becomes necessary, with some kinds of rope, to whip the ends of a strand in order to prevent them from fraying out.

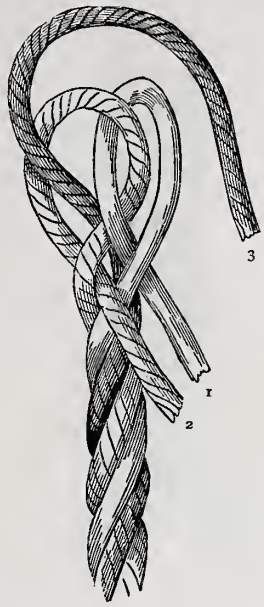


Fig. 14.—The Interlacing Carried One Step Further.

This having been done, the rope is taken in the hand in the position shown in Fig. 12. To aid in tracing the strands in their interlacing, they are each numbered and shaded differently. Fig 13 shows the interlacing commenced in one direction. A loop has been

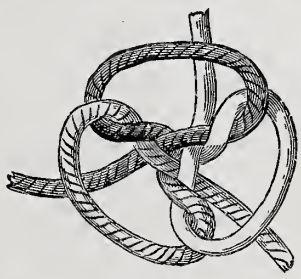


Fig. 15.—End View of the Rope After All of the Strands are Interlaced.

made with strand 3, and 1 is put through it. Strand 2 has not been touched. In Fig. 14 the end of strand 1 is shown tucked under itself and coming out next to the main or standing position of strand 3. In Fig. 16 we

Fig. 16.—All the Strands are Interlaced, but not Drawn Tight.

have the interlacing carried one step further and completed. Fig. 15 is a top view of Fig. 16. Now the ends are pulled so as to make all the turns come tight. When this is done we have the end in the shape shown in Fig. 17. If each of the ends or strands is tucked under the next strand but one, something after the fashion of basket weaving, and then all drawn tight, the end will appear as shown in Fig. 18. This finish is much used by boatmen for the ends of small ropes, and it is so secure, neat and useful that it is well worth the trouble which it takes to learn to make it.

A New Method of Reproducing Drawings.

M. M. Tilhot, of Paris, has devised the following method of reproducing drawings, &c., in any desired color: The

Fig. 17.—The Strands Drawn Tight, but not Fastened.

paper upon which the design is to be reproduced in order to prepare a negative copy, is first passed through a bath composed of the following materials in about the proportions given: White soap, 30 parts by weight; alum, 30 parts; Flanders glue, 40 parts; the white of eggs or albumen beaten up, 10 parts; glacial acetic acid, 2 parts; alcohol at 60°, 10 parts; water, 500 parts. After removal from this bath, the paper is passed through a second bath composed as follows: Burnt umber, ground in alcohol, 50 parts by weight;

Fig. 18.—The Finished End. Ends of Strands are Tucked Under.

black pigment, 20 parts; Flanders glue, 10 parts; water, 500 parts; bichromate of potash, 10 parts. The paper thus treated must be kept dry in a dark place. In order to prepare positive paper for the prints, a bath is used similar to the last, but without the umber, for which black pigment is substituted. Or, if it is desired to obtain colored proofs instead of black ones, the black pigment is replaced by a pigment of red, blue or any other desired color. To prepare the copies, the design or drawing is placed in an ordinary photographic printing frame, the back of the design being next to the glass, and a sheet of negative paper prepared in the way first described is placed in contact with it. The frame is then exposed to light, two minutes' exposure being sufficient in good weather. The sensitive paper is then

removed from the frame in a dark place and is placed in water, when the design becomes visible in white, aud the paper is allowed to dry. In order to obtain positive pictures from the negative thus prepared, the latter is placed in the priuting frame with a sheet of the positive paper prepared in the manner above describcd in contact with it, and after exposure to light for a sufficient time—that is to say, about two minutes—the positive paper is removed to a dark place and is pluuged into water, which removes the part of the pigment which has not been affected by the light, without its being necessary to touch it.

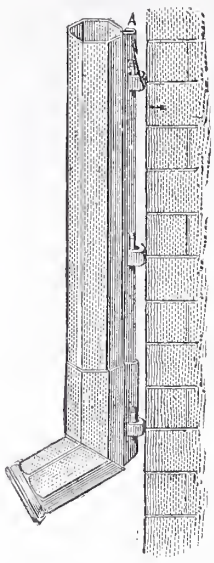
NOVELTIES.

DOUBLE ACTION CLUTCH SCREW DRIVER.

Of all the tools used by the mechanic there is hardly one to be found morc unsatisfactory than the screw-driver. The latest improvement upon this tool which we have seen is shown in the accompanying cut. At first glance the tool seems to be similar in most respects to those in common use, except that a decided improvemcnt has been made in

Novelties.—Fig. 1.—Improved Ratchet Screw Driver.

putting on a round haudle. A clutch in the ball of the handle, however, is so arranged as to convert the tool into a ratchet. The hand then keeps firm hold upon the handle and drives the screw in after the fashion of a ratchet brace. At the upper portion of the handle there are thin notches cut in the iron band with which it is surrounded, in which a latch or button works. This button is shown in the cut resting in the center one. When in this position handle and bit are firmly clamped together, as in the commou tool. Pushed to the left the handle revolves loosely on the spindle or bit to the left, but carries the spindle wheu turned to the right. This action is used when forciug a screw home. To turn a screw out the button is turned to the right, which causes the handle to carry the spindle in the opposite dirccticn. This arrangement enables the pressure upon the screw-driver to be constant, and allows the work to bc done with one hand alone. The strain of the work is all taken by the metal, none coming upon the wood. Altogether, the tool is one of the neatest and most valuable improvements in its line that we have seen. This form of screw-driver is especially useful in putting up many kinds of fixtures, esppcially when they are above the hcad. They also seem to be cspecially adapted to



Novelties.—Fig. 2.—Standing Seam Conductor Pipe—General View.

fine work, as they give the operator very complete contrc. of the screw. Messrs. Mallett & Co., Augusta, Me., are the manufacturers, and Messrs. Durrie & McCarty, No. 97 Chambers and 81 Reade streets, New York, are sole agents for these goods.

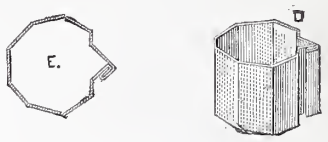
THE STANDING-SEAM CONDUCTOR PIPE.

The damagc caused conductor pipes by ice has put inveutors to work to devise shapes that are free from the defects of ordinary rouud pipe, which, it is well kuown, easily breaks by the formation of ice within. Our readers are doubtless familiar with some of the forms of expanding conductor pipes which are iu usc, and perhaps have employed them with satisfactory results. The pipe we illustrate herewith is octagonal in shape, and is made with an outside seam where the edges of the metal are joined, which gives it the name by which it is known. This seam serves as au expauding feature and also affords couvenient means for fastening the pipe in position. The theory upon which this and other improved pipes are constructed is that, if provision is made in the pipe to compeusate for the expansion of the ice in freezing, the pipe will uot burst. Since the cylinder, which can be constructed out of a given width of mctal, is in area the largest form that can be produced, aud since an octagoual form is considerably less than the cylinder, it follows that in the case of an octagonal pipe there is considcrable room for expansion before a breaking strain will come upon the metal from ice formed within it. It might be argued from this that the improved form of pipe is serviceable only for the first freeze, and that repeated formations of ice would finally burst it the same as an ordinary round pipe. This is perhaps true theoretically, but there are other conditious to be considered. The weakest point is always

Novelties.—Fig. 3.—Sectional View Through the Pipe in its Normal Condition.

the one to first give way, and au octagonal form offers less resistance to the ice than the round. Hence it is found in practice that the ice does not form repeatedly in the samc place, but that the water freezes in a uew placc each time. We have already meutioned that the standing scam affords one of the best expanding features of this particular form of pipe. By referring to the sections shown in the engraving it will be seen how this is accomplished, and also how the scam is still perfect after the pipe has been expanded. These general features led to an award of a premium medal at the Iustitute Fair at Boston a year ago, where this pipe was exhibited by Messrs. Badger & Son, the Eastern agents.

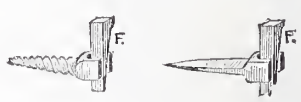
Still other advantages claimed for this pipe are that it is made in longer lengths than other pipe, thus doing away with many of the cross seams which are fertilc sources of breaks in ordiuary conductor pipes. It is readily fastened in position by clamps or holders, which grasp the standing seam, as shown in the engraving. Two forms of these fasteners are provided, one with a screw for use in connection with woodwork, and one with a shank to be driven into the mortar joint of brickwork. A wedge is employed in fastening the seam into the clamps, making a fasteniug which is easily relcased whenever it is necessary for any purpose to take the pipe down. Besides the octagonal form



Novelties.—Fig. 4.—Sectional View, showing the Effect of Expansion.

shown in the engravings, the manufacturers make an oblong pattern of the same general features, which is considered more desirable for use under certain circumstances. Elbows and shoes are made and supplied as required. Thc manufacturers are the Solderless Standing Seam Conductor Co., Limited, of No. 47 Federal street, Allegheuy.

Mechanics who feel that they are losing ground in competition with machinery, or that machiuery is gradually and surely reducing their wages and driving them to the wall in many cases, view the situation from a mistaken standpoiut. They judge of their mechanical skill, and estimate the positions they should rightfully hold, by the standards of a prcceding generation, rather than by the actual requirements of the present day. If a mechauic measures his skill and station in life by the experience of his father and grandfather who worked at the same trade before him, he makes a mistake. With scarcely anything more than simple hand tools, they produced finished work which gave them renown aud a position iu the world. They stood iu the first ranks, but their sort of skill is not demanded at the



Novelties.—Fig. 5.—Fastening for the Standing Seam Pipe.

prescnt day, because better ways of accomplishing the same results have been discovered. Accordingly, the mechanic who follows in their exact footsteps is greatly behind the times. On the other hand, if we examine the relative position in the trade held by either the father or the graudfather in his time, we shall find, uudoubtedly, that position and wealth were achieved by excelling his fellows—by being in the first ranks—aud that he strove quite as hard to get above mediocrity as it will be necessary for the mechanic of the present day to exert himself in order to get above the position of a mere machiue operative. There is abundant room in the upper stories in the trades as well as the professious. The world advances with respect to mechauical pursuits as well as with everything else, aud workmeu must keep pace with the times or else they will be left in positions alike unsatisfactory aud discreditable.

Architects are uot legally considered meubers of a profession in Canada. This is hard on men who profess to be architects.

CORRESPONDENCE.

The unusual amount of space required this month in order to properly display the competitive house plans, has reduced the limits of our correspondence department, and has caused us to omit our regular monthly installment of stair-building. In the limited space at our command we have devoted some attention to letters on this subject, and present a sketch from one of our readers, with a reply theroto prepared by the author of the papers we have bcon publishing. This, we trust, will serve to sustain the interest in this important branch. We expect to resume the regular course of articles in our next issue.

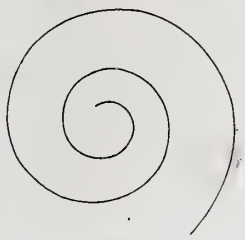
A number of the competitors in the competion just closed have submitted plans, requesting criticisms thereon. These we propose to consider through our correspondence department in subsequent issues. Those who have thus asked for adviee and assistance are, we feel, entitled to receive the same, and we shall take pleasure in serving them in the way indicated to the extent of our ability. The limited space at our command from month to month may defer the publication of such matters a little longer than is desirable, but we trust they will be none the less acceptable when they are reached. Some of the best plans submitted had fatal defects in manner of construction, and others were defective through mere carelessness in drawing.

Managing Work.

From S. W. H., *Russell, Kan.*—There is a short way and a long way of performing work. The first and most important part to learn wheu first taking charge of a piece of work is to avoid gettiug the "big head." The beginner should take into consideration that he may have men under him who are able to teaeh him something that will be to his interest. Accordingly, it is well for him to gain the good-will of all men in his employ. This accomplished, they are certain to work to his interest. It is well for him to avoid that spirit of intolerance and haughtiness that is often indulged in by the managers of work. If an employee should happen to make a mistake or to be laboring under a false conception with reference to certain parts of work, he should be treated kindly. By such conduct the mistaken idea may be often removed, while otherwise it would remain with him to his detriment. No man is infallible ; all are liable to err ; therefore a habit of saying something smart by findiug fault with others is to be condemned. One of the first things to do in taking charge of a piece of work is to study well the plans and specifications, in order to understand every part of them thoroughly. If it should happen that some explanation of any portion of them is needed, there should be no hesitation in going direct to the architect. Much depends upon the impression created in the mind of a superior, and therefore the beginner in the building business cannot be too careful as to the manner of approaching the architect. Let him take care to appear like a gentleman. Let him give thought to his boots, to the shavings and sawdust that may be sticking to his clothes, and a few moments' exercise with a whisk broom will make a great change in his appearance. Make your business known to the architect in as few words as possible. He will first scan you closely, and will then demand to know what you want. He will answer your questions, not in a way satisfactory in all particulars, and will close by saying that it must be that you do not understand your business and cannot read plans well or else you would not come with such questions. I am sorry to picture the architect in this way, but that such men are in the profession is too well known to builders at large to admit of denial. Instead of being pleasant in their manner and friendly to the men who have charge of their work, they hedge themselves about with a haughty demeanor which is calculated to impress all who approach them with an idea of their elevated dignity and wonderful ability. On the other hand, it seems to me that arehitects would accomplish their own ends better by reasoning with the builder and lending him some of the knowledge which they possess, thereby supplementing his experience in a way to accomplish the best results. I claim that the foreman in building operations is frequently able to give counsel to the architect. When he has studied the plans, and has nothing on his mind but the work that is to be done, it seems to me he should stand in the same relation to the architect that a conductor on a railroad train does to the dispatcher. This letter must be regarded only as an introduction to the subject concerning which I write, and I will defer to another time still other items of advice to the beginner in the building business.

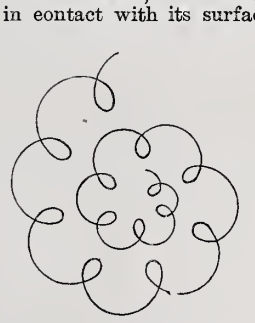
Experiments in Drawing Scrolls and Ellipses.

From O. T. B., *Rockton, Ill.*—The articles on the ellipse and ovals published some time since in *Carpentry and Building* interested me very much. After scratching my head a



Experiments in Drawing Scrolls and Ellipses. —Fig. 1.—A Scroll, the Result of the First Trial.

time or two I set about getting up a machine which I thought would not fail to execute ellipses of all sizes. But when I tried it on, the device produced a scroll every time. I found that I was able to make several varieties of such forms with accuracy, one of which is illustrated in Fig. 1 of the accompanying sketches. It would not, however, produce an oval, so I scratched my head again, and now think that by a slight improvement the scroll could be varied as indicated in Fig. 2. After considerable thinking and more scalp friction I attempted still another experiment. An iron rod, ½ inch in diameter, was brought out of the back room and set up on end. Then a board was pierced with a slot 4 inches long and the rod run through the hole. A thin board was attached to the rod by strips of tin, and a stick fastened to the board. A pencil was tacked to the end of the stick, and finally the board was placed with one end against a box, all as shown in Fig. 3 of my sketches. The board or wing, in turning around the rod, moved up and down, according to the inclination of the board, so that the pencil was kept in eontact with its surface at all



Experiments in Drawing Scrolls and Ellipses. —Fig. 2.—How the Scroll Might be Modified.

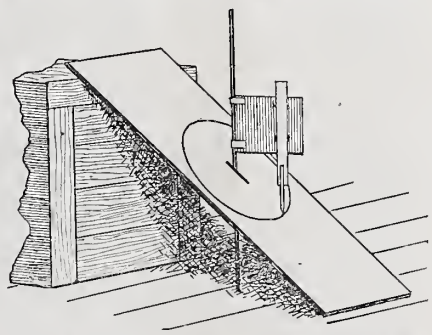
points. By this experiment I found that by holding the wing as described, perfect ellipses may be drawn, which will vary in length according to the pitch of the board.

Note.—We have no doubt that many of our readers will be interested in this description of our correspondent's experiments. One of the definitions of an ellipse to which we have before referred is that it corresponds to the oblique projection of a circle. What our correspondent has accomplished by inclining the board against a box and revolving a pencil in the manner he has described is equivalent to the oblique projection of a circle. Viewed at right angles to the plane upon which it is drawn, the figure described is an ellipse. Viewed, however, from a point directly over it—in other words, in the direction of the iron rod that passes through the board—the figure described will appear to be a circle.

Prevention of Dry Rot.

From B. & B., *St. Paul, Minn.*—Is there anything which will prevent dry rot in the timbers of a building? If so, will you please inform me through the columns of *Carpentry and Building.*

Answer.—As most of our readers know, dry rot is a name given to the decay of timber, which proceeds from a fermentation of sap left in the wood. It is brought about by the influence of warmth, moisture and a lack of ventilation. Green timber, or rather, that which has been used in building without proper seasoniug, is more liable to its effects than that which is thoroughly dried. It is said that timber cut in the spring, when the sap is rising, is more liable to be affected by this disease than that cut in the fall or winter, when there is less sap in the tree. There are various remedies for dry rot, among which are Kyanizing, creosoting, &c. Ventilation, however, which seems to be practically only a seasoning after the wood is in place, is the most generally applicable method of which we know. If the wood is kept constantly wet, if it belongs to the resinous species, it is less liable to decay. If kept thoroughly dry its life is almost equally long. Moisture, dampness, and want of ventilation are almost fatal to wood. It is on record, we believe, that some of the ships of the United States Navy, built in haste from very green timber during the war of 1812, were found to be affected with dry rot within twelve or fourteen months after they were launched. We know that wooden ves-



Experiments in Drawing Scrolls and Ellipses. —Fig. 3.—An Apparatus Producing an Accurate Ellipse.

sels have been frequently injured by dry rot within a very short time after they were finished, and in these cases the trouble has usually been want of ventilation, which prevented the sap from being dried out before fermentation took place.

Hopper Bevels.

From G. P. RANDALL, ARCHITECT, *Chicago.* —The roof and hopper illustration in my communication published in the January number was not correct. I obtained it from a book published by a prominent architect from Boston some forty years ago and did not at first notice that it was erroneous. In looking it over some time since, however, I did discover the error, but when I forwarded the sketch to you this circumstance did not occur to me. After I had sent it away I remembered that I had not made the correction, but as I doubted that any one would notice the discrepancy between it and the truth, I allowed it to stand. When, however, I saw the Editor's note at the foot of my communication, in which he whistled to the boys to go for me, I thought I had better send in a correction at once. My only regret is that the diagram as published is not strictly correct. In setting up the hight D F, I should have said : On D draw D R at right angles to A C, and produce it until it cuts A C at R. Then set up the distance D R from D to F and draw F M and F O. Then M F O will be the bevel for the up edge iu backing the hips.

Discussions of practical problems of this character in *Carpentry and Building* are of more consequence than ordinary newspaper matter, and accordingly should be correct. It raises a query whether, when the Editor

receives such things that he sees are wrong, it would not be better to return them to the author with the suggestion that they are incorrect, instead of publishing them to the world, to be used, perhaps, by generations yet unborn, as I used this one, blindly and thoughtlessly, by copying it in its incorrect condition.

Note.—We regret that the crowded condition of our columns this month precludes our publishing the diagram accompanying this communication from Mr. Randall. The explanation given above, however, will be understood, we think, by our readers without the engraving.

Concerning the policy of editing communications from correspondents, it has seemed to us that making the correspondence department a sort of debating club, in which every one's opinion should be subject to challenge and open to criticism, was better than to restrict it simply to expressions of the Editor's views upon the questions raised. No one mind, however well trained, can contain the fund of knowledge and experience which would render this department as interesting and useful as when it is conducted by a large number of practical men. We have touched upon this point of editorial policy in the past, and we believe that our readers, so far as they have expressed themselves, have coincided with us that more good is done by occasionally publishing something not altogether correct, thereby calling out criticisms, than by always publishing matter so correct or so commonplace as to be beyond criticism. We take pleasure in giving space to Mr. Randall's comments on his own paper.

Attention has also been called to these errors by W. G. P., of Toronto, Canada; A. O., of New York; T. C., of Elizabeth, N. J., and others.

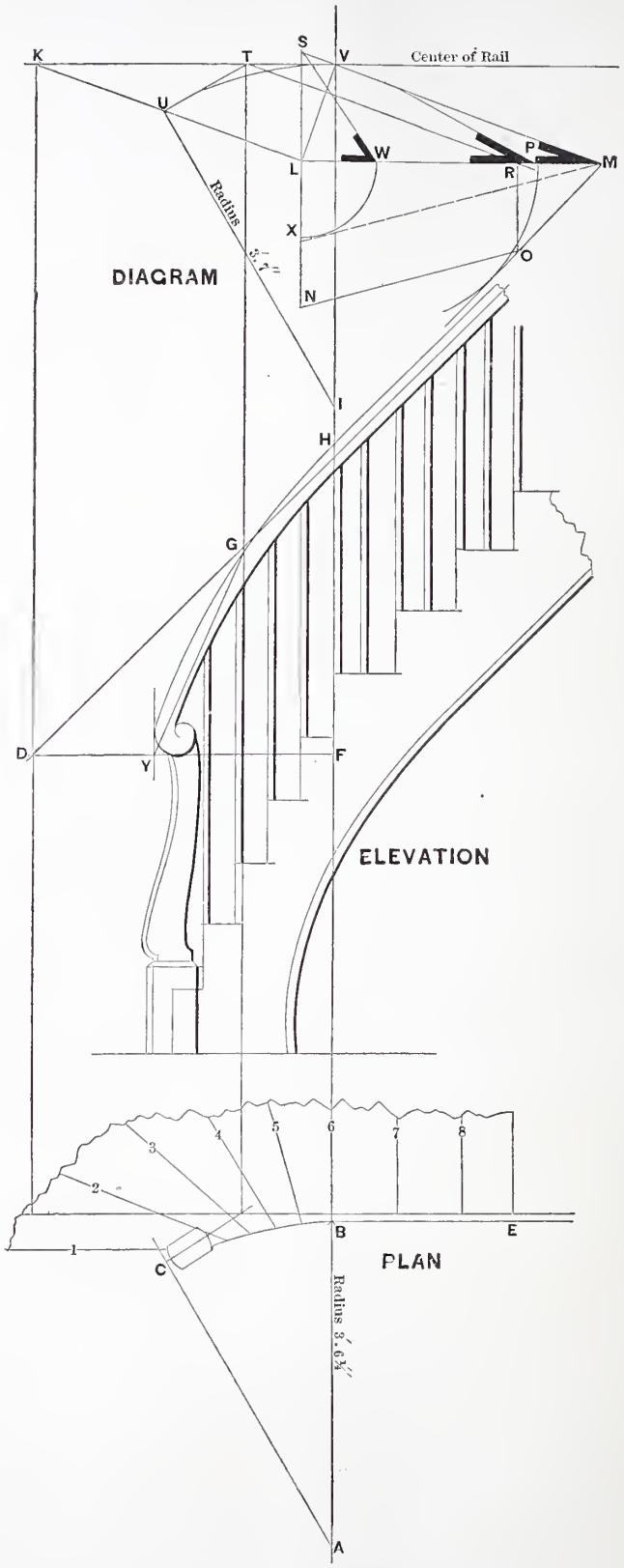
Problem in Hand Railing.

From N. P. L., *San Francisco.*—In the March number for last year your correspondent, S. N. W., of Coshocton, Ohio, presented a practical question in stair-building, which I will undertake to answer. In that number an engraving was published showing conditions under which a hand-railing was required to be constructed. I inclose a drawing which I think illustrates a method that will make a good job for an ordinary rail and post in the position named. The drawing is so clear that I think it will be understood by all practical men. Referring to it, there is presented a ground plan of the stairs, an elevation of the steps, rail, newel and balusters, and a drawing showing the method of working out the pattern for the rail. Referring to the latter, the line K L represents the intersection, L V the seat, S M the hight, L M the pitch of plank, N O M tangents for the face mold, M represents the side bevel, P the bevel for the top or shank end, and W the bevel for the scroll end at the newel.

Note.—This reply to S. N. W.'s question is, in some respects, very good, while in others it is somewhat obscure. The old-fashioned scroll ending at the bottom is, of course, not objectionable, provided it suits the party for whom the work is to be done. The manner of obtaining the tangent lines for the face mold wreath-pieces and the necessary bevels for the butt joints is not sufficiently explained, and we doubt if our readers generally will obtain from it the information they desire. The bevel for the top end is incorrect, and as shown is not capable of explanation by any principles with which we are acquainted. We may do our correspondent injustice, but as here presented it looks somewhat like guesswork. In order to make this answer of the greatest possible service to our readers, we introduce in Fig. 2, on an enlarged scale, a similar plan with additional lines, in order to clearly show principles, and will explain it in detail. In this the top end bevel is drawn correctly by a method as nearly resembling that which our correspondent has employed as is possible.

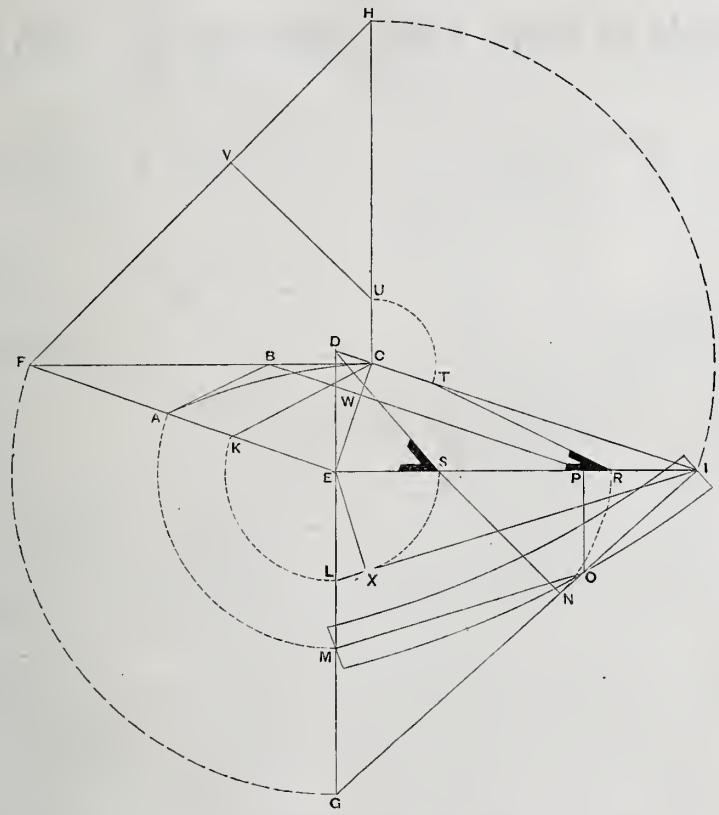
Referring to the sketch sent in by our correspondent, let it be understood that the plan is a face view of the stairs, taken from the stretchout of the ground tangent lines as found in the elevation. The necessary elevations of the tangents are thus given: The diagram at the top is the method by which the inclination of the elevated tangents to each other is obtained, together with the plumb bevels for determining the twist. A slide bevel is also given. In Fig. 2, let A B B C be the ground tangent lines of the curve passing from A to C. Suppose, in the elevation, C H F erected upon the line C B F; the line C F represents the pitch of the upper tangent which joins the straight rail, the hight C H being the whole hight occupied by both tangents. Then as the line C F meets the horizontal plane of the ground plan at F, a line drawn through F and A would be a level line, or, in other words, would be the intersection of the elevated plane of plank with the horizonal plane of the ground plan. Produce F A to E and draw E I at right angles with D E. The elevation E D I produced over E I shows the pitch of the plank. To draw the top elevation, draw the line E G at right angles with E I and equal in length with E F of the ground plan. We now have a figure which, if folded up so as to bring corresponding points together, will give us the elevated plane of the wreath-piece in its proper position, the planes over C E and E F being vertical.

To obtain the elevated tangents, with their inclination to each other, is now very simple. The line B P may be drawn parallel with F E, and from the point where it meets the pitch line E I draw P O at right angles, meeting the rake line I G in the point O. I O is now the upper tangent standing over C B. Make E M of the elevated plan equal to E A of the ground plan and draw M O. M O is now the lower tangent of the wreath-piece. The face pattern, if drawn directly from these tangents, as shown in the figure, will be bottom up and must be turned over to be placed upon the top of the plank.



Problem in Hand Railing.—Fig. 1.—Sketch sent in by N. P. L.

The plumb bevel for the lower end is obtained as follows: At right angles with the pitch line I E draw E D, meeting the hight line I C, produced in the point D. This forms the base of a triangle by which we gain the bevel. Next draw I L parallel with O M, and from E draw E X at right angles with I L. The line E X being transferred to the line E I, which is at right angles with the line E D of the triangle, giving the point S, forms the altitude. Join S and D. Then at S will be the plumb bevel of the wreath at the end A. That is, we have now measured the solid angle which would be formed by the intersection of the elevated plane of the plank with a vertical plane lying in the direction A B, or the parallel one which we have supposed to be erected upon K C. If the whole figure were now to be folded up, and the small triangle E C D be turned under, making D C



Problem in Hand Railing.—Fig. 2.—Method of Obtaining the Bevels and Pattern of Wreath-Piece.

vertical, then E D, the base line of the bevel triangle, will be perpendicular to the elevated plane which stands in the plane E C F. Therefore, any line drawn from E upon the plane at E S will be at right angles with E D. Therefore the hypothenuse lines in the vertical plane over K C and S are the solid angle sought. To obtain the bevel for the upper end of the twist, we must obtain the solid angle whose vertex in the figure when folded up is the line I G. For convenience let us begin at the point S and draw S N upon the elevated plane at right angles with I G. On the vertical plane over C F take H V, equal to I N, and draw V U at right angles with H F. Transfer the hight C U thus obtained on to the line C I, obtaining the point T. We now have two lines representing the solid angle whose vertex is C F, with the points at which their extremities fall upon the edges of the vertical plane whose base is E C. Now, from T and S as centers, with the distances V U and S N respectively, draw arcs intersecting at the point R, which in this case happens to fall upon the line E I. Joining T and R, the angle formed at R is the solid angle desired. Both bevels apply from the same side of the tangent lines.

If the inside and outside lines of the face pattern are to be drawn as arcs of ellipses, the major axis must be in the direction of E C, and on the elevation of the pitch line E I. It is hardly necessary for us to explain this manner of drawing the pattern and dividing the mold. The plank from which the rail is to be cut need not be thicker than the width of the rail, the extra part of the scroll being glued on underneath.

Barn Cupola.

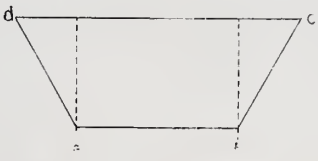
From C. C. T., *Bristol, Ohio.*—I am about to build a barn 24 by 30 feet, with 16-foot posts, for which I desire a cupola. Will some practical reader of the paper furnish me a plan with details for a structure of this charaeter having curved roof? I desire to ask in this connection if the above size of building is well proportioned. If so, what width should the corniee be, the latter being plain in its general character? The site of the barn is about 150 feet from the street and at an elevation of 7 or 8 feet.

Note.—Our correspondent may receive some assistance in the matter of the cupola design by consulting our volumes for 1879 and 1880. This question was raised during the periods named, and several designs were published, although they may not be just what he requires in the present case. Any designs which our readers see fit to send us, and which are suitable for publication, will be engraved and presented in our columns, in answer to this inquiry.

Howe Trusses, Hopper Bevels, Etc.

From H. McG., Journeyman Carpenter.—Nary an Irishman's initials have graced your columns since I there gazed on mine. Have you a sign up, "No Irish need apply?" I will give you a slight taste of Paddy's ignorance again, as mightn't an Irishman be as well dead as speechless, and it is a long time since I shot my mouth off at you. "Waltham" wants to know what gives the camber in a Howe truss? I am an intensely practical reader, my dear fellow. It is framed in by lengthening each brace, and counter-braced enough to make the chord segments of nearly flat arches. And if you ever attempt to camber a Howe truss that has been framed with perfectly straight chords by screwing up the bolts, you have a healthy old job before you; they won't camber worth a cent. "S. P. J." had better buy a book and study up his Howe truss. It is not presumed that a journeyman can or will know anything about the tension in chords and struts, dead or live loads, or formulas, or other nonnense of the kind. Two dollars per day is not enough for all the arts and sciences and timber-lugging, too. I have hitched on the last with both hands, and relegated the arts, &c., to the boss.

Well! well! here are these hopper-bevel chaps again. The racket seems to be that all that is necessary to make a number-one-bang-up-top-of-the-heap-cock-of-the-walk carpenter is to know hopper bevels. As the Dutch wood-butchers here used to think that when they could make a four-panel 1¼ door, that was all, and if they could hang an inside blind there was no further incentive in life. Now, I don't know much about hopper bevels; never pursued the thing to the limits. The stumbling in hopper bevels with most carpenters is that they can't get through their skulls the fact that the bevels are independent of each other; that the side bevel can be obtained without the top one, or t'other way about. Suppose A to D, inclusive, is the elevation of a hopper. Get out the stuff the width B to C. Lay off on the bottom the length A to B; on the top, the distance C to D. Connect the lines, and the side bevels obtain themselves! Terrible mystery about this, ain't there? If the top is level, a straight 45° miter cuts the joint; if beveled, the same process as the side cuts the top bevel. Or the top bevel can be obtained by any rule that will cut a level purlin or rafter against a hip. There is no line, no cut, no piece required in any hopper that can't be found accurately by any of the rules that are rules for framing hip roofs.



H. McG.'s. Hopper Bevel Diagram.

Some persons here, and, by the general apppearance of things, somewhere else also, have more humbug, more secrecy, more mystery about getting the lines for and making a hopper than if they'd discovered perpetual motion, and were afraid some lunatic would find out how it was done.

I would like "practically" to try "C. L. G.'s" problem on strength of his floor, but it is so indefinite that I'll have to pass it to some one more familiar "with theoretical knowledge or book rules" (my before mentioned remark will apply here); to some one with more "technical education and finish."

White Lead for Tin Roofs.

From J. H. T., *Glidden, Iowa.*—Can you tell me why white lead is not a good paint for a tin roof?

Answer.—It has been found by many who have used white lead for the purpose, that the lead is decomposed under a sort of double chemical action, the lead taking at times the metallic form and the iron rapidly oxidizing. The tin is usually so thin that its value as a protection can be ignored. In some situations the destruction of the iron is very rapid indeed, while in others the action is comparatively slow. One of our readers reported a case, a year or two since, where the lead paint was decomposed to such an extent as to show globules of metallic lead. The iron in that case was almost all in the form of rust or oxide.

Iron Roofs.

From A. Northrop & Co., *Pittsburgh, Pa.*—We think the iron roofing manufacturers owe *Carpentry and Building* a vote of thanks for the very fair and intelligent manner in which the subject of iron roofing has been placed before its readers. Certainly, all should be satisfied with the impartiality displayed in treating the subject. There is only one error to which we shall call attention, and which we believe, in justice to several manufactures besides ourselves, should be corrected. Messrs. Caldwell & Co., the Eureka Iron Roofing Co., Messrs. Mosher & Thompson, of Cleveland, W. G. Hyndman & Co., of Cincinnati, as well as ourselves, all make roofing, the sheets of which are completely finished in the factory before shipping. By the wording of the article in question it would seem that only Scott & Co. prepared their iron complete in this manner. We feel sure that the writer did not intend to show favoritism, and fell into the mistake inadvertently.

Note.—In justice to all, we take pleasure in publishing the above letter, which, we believe, states the case correctly.

Strength of Cypress Timber.

From L. A., *Clinton, La.*—Please give me the breaking strength of cypress timber as compared with pitch pine.

Note.—In looking over our tables on the strength of materials, we do not find that cypress has ever been mentioned in a way to show conclusively what its strength is in comparison with other woods. Haswell gives the strength of cypress as 6000 pounds per square inch for a tensile strain, which is about one-half that of pitch pine, according to the commonly accepted figures. He gives no data whatever in regard to its breaking strength crosswise. Trautwine, whose figures in regard to things of this kind are considered among the best, makes no mention of the crushing strength of cypress, but gives the tensile strength the same as Haswell. He gives no figures of its transverse strength, not even mentioning the wood.

REFERRED TO OUR READERS.

Hardwood Finish.

From L. S. T., *Martinsville, Va.*—Some time since, in "Stray Chips," there was a little note about some house that was completed somewhere in Virginia, black walnut and ash inside finish. Will the owner or builder give me, through the paper, the outlines of finish? Would like to know how he combined the woods.

Designs for Street Fronts.

From T. Y. R., *Crested Butte, Col.*—I should like to see published in *Carpentry and Building* some designs for square fronts for store buildings, such as are generally used for country towns. For dimensions, say 20 to 25 feet front, as circumstances may require. If some of the readers of the paper who have had experience in building street fronts of this character will contribute their designs to *Carpentry and Building*, I am sure it will be of advantage to the readers generally.

Ventilating Dwelling Houses.

From E. D. C., *Randallsville, N. Y.*—I wish the practical correspondents of *Carpentry and Building* would give their attention to expedients for ventilating dwelling houses. This is a subject that is very little understood by the people at large, and is one that, it seems to me, practical men might handle to advantage.

Prices of Building Materials in New York, January 20, 1882.

Blinds.—OUTSIDE.

Per lineal, up to 2.10 wide	$	@ 0.24
Per lineal, up to 3.1 wide	....	@ 0.26
Per lineal, up to 3.4 wide	....	@ 0.28
Per lineal, paint'd and trim'd	0.45	@ 0.55
INSIDE.		
Per lineal, 4 folds, Pine	....	@ .53
Per lineal, 4 folds, ash or chestnut	....	@ .78
Per lin'l, 4 folds, cherry or butternut	....	@ .96
Per lineal, 4 folds, bl'k wal't.	....	@ 1.06

Bricks.—(Afloat.)

Pale	⅌ M. $4.25	@	4.75
Jersey	" 7.00	@	7.50
Long Island	" 8.00	@	8.50
Up-River	"	@	....
Havers'aw Bay, 2ds	" 8.25	@	8.75
Havers'aw Bay, 1sts.	" 8.75	@	9.00
Croton—Brown	" 11.00	@	....
Croton—Dark	" 13.00	@	....
Croton—Red	" 13.00	@	....
Philadelphia Fronts	"	@	36.00
Trenton "	"	@	36.00
Baltimore	" ...	@	....

Yard prices 50c. ⅌ M higher, or, with delivery added, $1.50 per M for Hard, $2.00 for Crotons and $6.00 per M for front Brick.

FIREBRICK. (yard prices).

Red Welsh	$35.00 @	....
Scotch	30.00 @	....
English	30.00 @	32.00
Silica (English)	35.00 @	....
Silica (Welsh)	50.00 @	....
Stourbridge	50.00 @	....
American, No. 1	..... @	40.00
" " 2	..... @	30.00

Afloat, 500 ⅌ M less

Cement.—(Cargo rate.)

Rosendale, ⅌ bbl.	$1.40 @	....
Portland Saylor's American, ⅌ bbl	2.30 @	2.40
Portland (imported) ⅌ bbl.	2.85 @	3.25
Roman "	3.00 @	3.25
Keene's coarse "	6.00 @	....
Keene's fine "	.... @	10.50

Add 25 cts. to above rates for yard prices.

Doors.

RAISED PANELS, TWO SIDES.

2.0 x 6.0	1¼ in.	$1.04	....
2.6 x 6.6	1¼ in.	1.38	....
2.6 x 6.8	1¼ in.	1.44	....
2.8 x 6.8	1¼ in.	1.50	....
2.10 x 6.10	1¼ in.	1.61	....
3.0 x 7.0	1¼ in	1.86	....

MOULDED.

Size.	1¼ in.	1½ in.	1¾ in
2.0 x 6.0	$1.70	....	....
2.6 x 6.6	2.03	2.59	....
2.6 x 6.8	2.07	2.62	....
2.6 x 6.10	2.11	2.68	....
2.6 x 7.0	2.27	2.71	....
2.8 x 6.8	2.16	2.75	3.84
2.8 x 7.0	2.35	2.83	3.99
2.10 x 6.10	2.28	2.92	4.09
3.0 x 7.0	2.54	3.09	4.37
2.6 x 7.6	2.47	3.02	....
2.8 x 7.6	2.59	3.16	4.43
2.10 x 7.6	2.72	3.30	4.66
3.0 x 7.6	....	3.45	4.85
2.6 x 8.0	2.59	3.16	....
2.8 x 8.0	....	3.31	....
2.10 x 8.0	....	3.47	5.14
3.0 x 8.0	....	3.62	5.42

2nd quality 15 cts. less.

Drain Sewer Pipe.

Discount 50 to 55 per cent. according to quality and size of order.

Pipe, per foot.	Bends & Elbows, Each.	Branches Sing.	Branches D'bl. & V.	Traps, Each.
2 in. $ .13	$ .40	$ .48	$ ...	$1.00
3 " .16	.50	.61	...	1.25
4 " .20	.65	.75	1.30	1.75
5 " .25	.85	.90	1.55	2.50
6 " .30	1.15	1.05	1.80	3.50
7 " .35	1.50	1.20	2.05	5.00
8 " .45	2.00	1.45	2.45	6.00
" .55	2.50	1.70	2.85	7.00
10 " .70	3.00	2.00	3.30	8.00
12 " .80	3.75	2.52	4.24	10.00
15 " 1.25	5.00			
" 1.60	7.50			

Branches: Longer than 1 ft., charged as pipe.

House Branches pr. lin. ft.	Sewer Branches pr. lin. ft.,
15x6 $1.75	15 in. $2.25
18x6 2.50	18 " 3.00

Glass.—(American.)

Prices current per box of 50 feet.

SINGLE.

Sizes.	1st.	2d.	3d.	4th.
6x 8—10x15	$8.25	$7.50	$7.00	$6.50
11x14—15x24	9.25	8.50	8.00	7.25
16x24—20x28	10.75	9.75	8.75	7.75
15x34—24x30	12.25	10.75	9.00	8.50
26x28—24x36	13.00	11.50	9.75	9.00
26x36—26x44	14.50	13.25	10.75	9.50
26x46—30x50	15.00	14.00	11.25	10.50
30x52—30x54	16.00	14.50	12.00	...
30x56—34x56	17.25	15.50	13.50	....
34x58—34x60	18.25	17.25	15.00	....
36x60—40x60	20.75	18.75	17.25	....

DOUBLE.

Sizes.	1st.	2d.	3d.	4th.
6x 8—10x15	$12.75	$11.75	$10.75	$10.00
11x14—15x24	14.50	13.25	12.50	11.25
16x24—20x28	17.25	15.75	14.00	....
15x34—24x30	19.75	17.25	14.50	....
26x28—24x36	21.00	18.50	15.75	...
26x36—26x44	23.25	21.25	17.25	...
26x46—30x50	24.00	22.50	18.00	...
30x52—30x54	25.75	23.25	19.25	...
30x56—34x56	27.75	25.00	21.75	...
34x58—34x60	29.25	27.75	24.00	....
36x60—40x60	33.25	30.00	27.75	....

Sizes above—$10 per box extra for every five inches.

An additional 10 per cent. will be charged for all glass more than 40 inches wide. All sizes above 50 inches in length, and not making more than 81 united inches, will be charged in the 84 united inches' bracket.

Discounts: Single, 60 & 20 %; Double, 70 %.

French

WINDOW, PICTURE AND CAR GLASS.

Prices current per box of 50 feet.

SINGLE.

Sizes.	1st.	2d.	3d.	4th.
6x 8—10x15	$10.00	$9.25	$9.00	$8.50
11x14—16x24	11.50	10.75	10.25	9.50
18x22—20x30	14.75	13.75	12.50	11.50
15x36—24x30	16.50	14.75	13.00	....
26x28—24x36	17.50	16.00	14.00	....
26x36—26x44	18.75	17.25	14.50	....
26x46—30x50	20.50	19.25	16.50	...
30x52—30x54	22.75	21.00	18.00	....
30x56—34x56	24.00	22.00	19.75	....
34x58—34x60	25.25	23.75	21.50	..
36x60—40x60	28.50	26.00	23.75	..

DOUBLE.

Sizes.	1st.	2d.	3d.	4th.
6x 8—10x15	$13.00	$12.25	$11.75	$11.00
11x14—16x24	15.75	14.75	14.00	8.25
18x22—20x30	20.00	18.50	17.00	....
15x36—24x30	22.00	20.00	17.75	....
26x28—24x36	24.00	22.50	19.25	....
26x36—26x44	25.00	23.5	20.00	....
26x46—30x50	27.00	25.25	22.00	....
30x52—30x54	30.00	28.00	21.00	....
30x56—34x56	31.50	29.00	26.25	....
34x58x34x60	33.00	31.50	28.50	....
36x60—40x60	37.00	34.00	32.00	....

Sizes above—$10 per box extra for every five inches.

An additional 10 per cent. will be charged for all glass more than 40 inches wide. All sizes above 52 inches in length, and not making more than 81 united inches, will be charged in the 84 united inches' bracket.

Discounts: 6 & 20 %.

GREENHOUSE, SKYLIGHT AND FLOOR GLASS

Per square foot, net cash.

	case	cut to size
⅛ Fluted plate	10c;	16c.
3-16 Fluted plate	13c.	18c.
¼ Fluted plate	16c.	20c.
¼ Rough plate	16c.	20c.
⅜ Rough plate	21c.	27c.
½ Rough plate	28c.	33c.
¾ Rough plate	45c.	55c.
1 Rough plate	55c.	65c.

Hair.

Cattle ⅌ bushel, $16.00 @ ...
Goat " 22.00 @ ....

Lath.

Cargo rate ⅌ M $2.00 @ ....

Lime.

Glen's Falls, or Keenan's common, cargo rate ⅌ bbl. @ 1.15
Glen's Falls, or Keenan's finishing Jointa 1.35 @....
Rockland, common 1.25 @....
Rockland, finishing 1.40 @....

Add 25c. to above figures for yard rates.

Lumber.—(Yard prices.)

Pine, very choice and ex. dry. ⅌ M. ft. thick	$70.00 @	$75.00
Pine, clear	60.00 @	65.00
Pine, selects	50.00 @	55.00
Pine, pickings	40.00 @	45.50
Pine, selected, box	22.00 @	25.00
Pine, common box	18.00 @	22.00
Pine, common box, ⅝	16.00 @	17.50
Pine 1¼x10, 13 ft., matched, each	.42 @	.45
Pine, 1¼x10, 13 ft., culls	... @	.30
Pine, 1x10, 13 ft., good matched, each	.30 @	.32
Pine, 1x10, 13 ft., common, matched, each	.25 @	.28
Pine, 1x4½, clear, match'd, each	.22 @	.24
Pine, 1x4½, merchantable, matched, each	... @	.18
Pine, 1¼x4½, cl'r, match'd, each	.35 @	.38
Pine, 1¼x4½, merchantable, matched, each	.30 @	.32
Spruce, 1x9, 13 ft., rough.	.20 @	.21
Spruce, 1x9, 13 ft. matched, each	.23 @	.25
Spruce, 1¼x9, 13 ft., rough.	.23 @	.25
Spruce, 1¼x9, 13 ft., matched, each	.28	30
Spruce, 2x9, 13 ft., rough	.37 @	.39
Spruce, 2x9, 13 ft., match'd, each	.43 @	.46
Spruce, 2x4, 13 ft	.15 @	.16
Spruce timber, flat, ⅌ M ft	20.00 @	.....
Spruce timber, square, ⅌ M ft	..... @	22.50
Hemlock, 1x10, 13 ft., each.	.16 @	.18
Hemlock, 2½x4, 13 ft., each.	.16 @	.17
Hemlock, 3x4, 13 ft., each	.19 @	.20
Hemlock, 4x6, 13 ft., each	.40 @	.44
Ash, good, ⅌ M ft	45.00 @	55.00
Oak	45.00 @	55.00
Oak, quartered	70.00 @	90.00
Maple, common	25.00 @	35.00
Maple, good to 2 in	40.00 @	45.00
Maple good thick	45.00 @	55.00
Maple white	55.00 @	65.00
Chestnut	40.00 @	60.00
Bl'k walnut counters, ⅌ ft.	.18	@ .30
Black walnut, selected and seasoned, ⅌ ft	.12½ @	.15
Bl'k walnut, good to choice	105.00 @	125.00
Black Walnut 2d	85.00 @	95.00
Black walnut, ⅝	90.00 @	100.00
Cherry, wide, ⅌ M ft	100.00 @	110.00
Cherry, ordinary	85.00 @	95.00
Whitewood, or Poplar ⅝ in.	35.00 @	40.00
Whitewood, or Poplar ⅝ panels	45.00 @	60.00
Whitewood, or Poplar 1 to 1½ inch	45.00 @	55.00
Whitewood or Poplar, 2 in. and upward	50.00 @	55.00
Shingles, extra sawed pine, 18 in.	5.00 @	....
Shingles, clear sawed pine, 18 in., 2 md	4.00 @	....
Shingles, cypress, 7x24	15.00 @	18.00
Shingles, cypress, 6x20	12.00 @	14.00
Shingles, Cedar, 6x24, No. 1	— @	22.00
Shingles, Cedar, 6x24, A's	— @	16.00
Shingles, Cedar, 6x20, No. 1	— @	12.50
Shingles, Cedar, 6x20, A's	— @	10.00
Shingles. Cedar Eastern.	— @	3.50
Shingles, Hemlock	— @	3.75
Shingles, Pine	4.00 @	5.00
Shingles, Spruce	— @	3.50
Shingles, Redwood (California), ordinary, per bunch.	— @	.85
Shingles Redwood (California) 6x16 cut	— @	1.85
Yellow pine dressed flooring, wide, ⅌ M ft	37.00 @	40.00
Narrow ditto	40.00 @	45.00
Yellow pine timber	35.00 @	50.00
Locust posts, 8 ft., ⅌ in	.18 @	.20
Locust posts, 10 ft.	.24 @	.25
Locust posts, 12 ft	.25 @	.30
Chestnut posts, ⅌ ft	.03 @	.3½
Mahogany, ¼ in. ⅌ ft	.05 @	.07
Mahogany, ⅜ in. ⅌ ft	.10 @	.12
Mahogany, ½ in. ⅌ ft	.10 @	.16
Mahogany, ⅝ in. ⅌ ft	.12 @	.16
Mahogany, ¾ in. ⅌ ft	.14 @	.16
Mahogany 1 in. ⅌ ft	.18 @	.22
Rosewood, ⅛ in. ⅌ ft	.11 @	.15
Rosewood, ¼ in. ⅌ ft	.16 @	.20
Rosewood, ⅜ in. ⅌ ft	.24 @	.28
Rosewood, ⅝ in. ⅌ ft	.40 @	.45
Rosewood, 1 in. ⅌ ft	.60 @	.75
Satin wood, ½ in. ⅌ ft	.30 @	.40
Satin wood, 1 in. ⅌ ft	.40 @	.55
White holley ¼-inch	.10 @	.12
White holley ⅜-inch	.15 @	.18
Cedar (Cuban and Mexican) ⅌ ft	.10 @	.14
Cedar (Florida) Less than 1 inch	.10 @	.24
1 inch and over	.25 @	.30
Redwood (California) 1 to 2 in., dry, per M	@	60.00
3 in. and over, per M	@	60.00

Moldings.

50c. to 60c. per inch per 100 feet, according to quality.

Paper.

Rope, waterproof building, ⅌ ℔. 16c @ 17c
Rosin Sized Sheating, ⅌ ℔. 4c @ 5c
Dry Sheating ⅌ ℔ 3c @ 3½c
Tarred Felt, ⅌ ℔ .... @ 3c

Plaster.

Calcined City Mill rate..$1 25 @ ....

Sash.

GLAZED.

Dimensions of windows.	12 Lights. 1¼pl.	12 Lights. 1¼c.	12 Lights. 1½c.	8 L's. 1½c.	4 Lights. 1¼c.	4 Lights. 1½c.
2.1x3.6	$1.04	1.10	...	....	....	....
2.4x3.10	1.13	1.21	....	....	1.32	....
2.7x4.6	1.36	1.44	....	....	1.67	1.77
2.7x4.10	1.52	1.58	....	....	1.75	1.86
2.7x5.2	....	1.69	....	....	2.03	2.15
2.7x5.6	...	....	....	2.13	2.22	2.35
2.7x5.10	....	....	....	2.23	2.32	2.49
2.10x4.6	1.52	1.63	1.73	....	....	....
2.10x5.2	1.72	1.82	1.97	2.19	2.24	2.39
2.10x5.6	1.83	1.93	2.12	2.33	2.36	2.53
2.10x5.10	2.14	2.26	2.45	2.46	....	2.73

c. means counted checked—plowed and bored for weights.

Hot bed sash, glazed $2.42

HEAD LIGHT.

Two or three Lights, Glazed.

Size.	1¼	1½	Size.	1¼	1½
2.6x1.0	46	54	2.10x1.0	54	62
2.6x1.6	58	62	2.10x1.6	69	75
2.8x1.0	54	58	3.0x1.0	58	69
2.8x1.6	62	69	3.0x1.6	76	85

Slate.

By car load, delivered in New York.

Purple roofing slate, ⅌ sq're.	$5.50 @	$6.00
Green slate	6.00 @	6.50
Red slate	11.00 @	....
Black slate, Pennsylvania	4.50 @	5.00
Tiles, 1¼ in. rubbed, ⅌ sq. ft.	@	.30

⅌ sup. ft.

Steps and platforms, 1½ in. thick; Risers, 1 inch thick, prices nominal....
" " 2 " ....
Red tile and borders..................
Coping, 1½ " ....
" 2 " ....

Lineal ft.

Window sills, 4x7..................
" 3x7..................
Window caps, 4x10, plain..................
" 4x8, " ....
" 3x10, " ....
" 3x8, " ....

Stair Material.

BALUSTERS.

Black Walnut.	1½ in.	1¾ in.	2 in.	2½ in
Fancy Turned	10c	12c	15c	22c
Neck Turned	11c	13½c	16½c	23c
Fluted or Octagon	19c	22c	24c	28c

OCTAGON PANELED NEWELS.

Panels Veneered with French Walnut.

8-inch Newels, with Cap $9.00
9 " " " 10.00
10 " " " 11.00

SOLID NEWELS, WITH CAPS.

Black Walnut.	5 in.	6 in.	7 in.	8 in.
Fancy Turned	$2.25	$2.90	$4.00	$3.25
Octagon	2.75	3.40	4.50	5.75

STAIR RAIL.

Worked out and finished ready to put up. Easements and cylinders counted double. Price per foot Newels and Balusters not included).

Black Walnut.	3 in.	3½ in.	4 in.	4½ in
Molded	44c	48½c	55c	61c
Toad Back		58c	63c	72c

STAIR RAIL, UNFINISHED.

Price per foot.

Black Walnut.	3 in.	3½ in.	4 in.	4½ in
Molded	13c	16c	18c	21c
Toad Back		17c	19c	22c

Stone.

Cargo rates, delivered at New York.

Amherst Blue		$1.00
Amherst freestone, in rough, ⅌ C ft		1.00
Bay of Fundy, Wood Point, brown	0.80 @	1.00
Bay of Fundy, Mary's Point, brown	$0.80 @	1.00
Bay of F'dy, Mary's Pt., olive.	0.80 @	1.00
Berlin Blue	.... @	1.00
Berlin freestone, in rough	.... @	1.00
Berea freestone, in rough	0.85 @	.90
Brown stone, Portland, Ct.	1.25 @	1.50
Brown stone, Belleville, N. J.	1.00 @	1.50
Corsehill (Scotch) Red Sandstone	@	1.00
Granite rough	.50 @	1.00
Dorchester, N. B., stone, rough ⅌ foot.	.... @	1.00

BLUE STONE

Rubbed hearth, 10 ft. or under	25c
Rubbed hearth, 20 ft. or under	35c
Rubbed hearth, 30 ft. or under	45c
Rubbed hearth, 40 ft. or under	50c
Rubbed sills	30c
Sawed & Planed	40c
Sills and lintels	@ 18c
Sills and lintels, fine quarry cut sills	@ 35c
Coping, 11 to 18 in. wide	20c @ 34c
Coping, 20 to 28 in. wide	38c @ 60c
Coping, 30 to 36 in. wide	65c @ 80c
Steps, 8 in	@ 60c
Steps, 7 in	@ 55c
Steps, 6 in	@ 35c
Steps, door, per in. wide	@ 3c
Platforms, promiscuous, 4 in.	@ 32c
Wyoming Valley, promiscuous, per cubic ft	1.30 @ 1.3

Vault Lights.—Nominal.

Platform, sq ft	$3.50
Step and risers, sq. ft	3.50
Floor light, sq. ft	2.50
Roof light, sq. ft	2.50
Platform, 2d quality, sq. ft	2.60

COVERS.

Diameter.	Round.	Hexagon.
14 inch	$3.00	$0.00
16 "	3.75	4.00
18 "	5.50	6.00
20 "	8.00	8.50
24 "	14.00	15.00
26 "	16.00	17.00
30 "	23.50	25.30
63 "	31.00	30.50

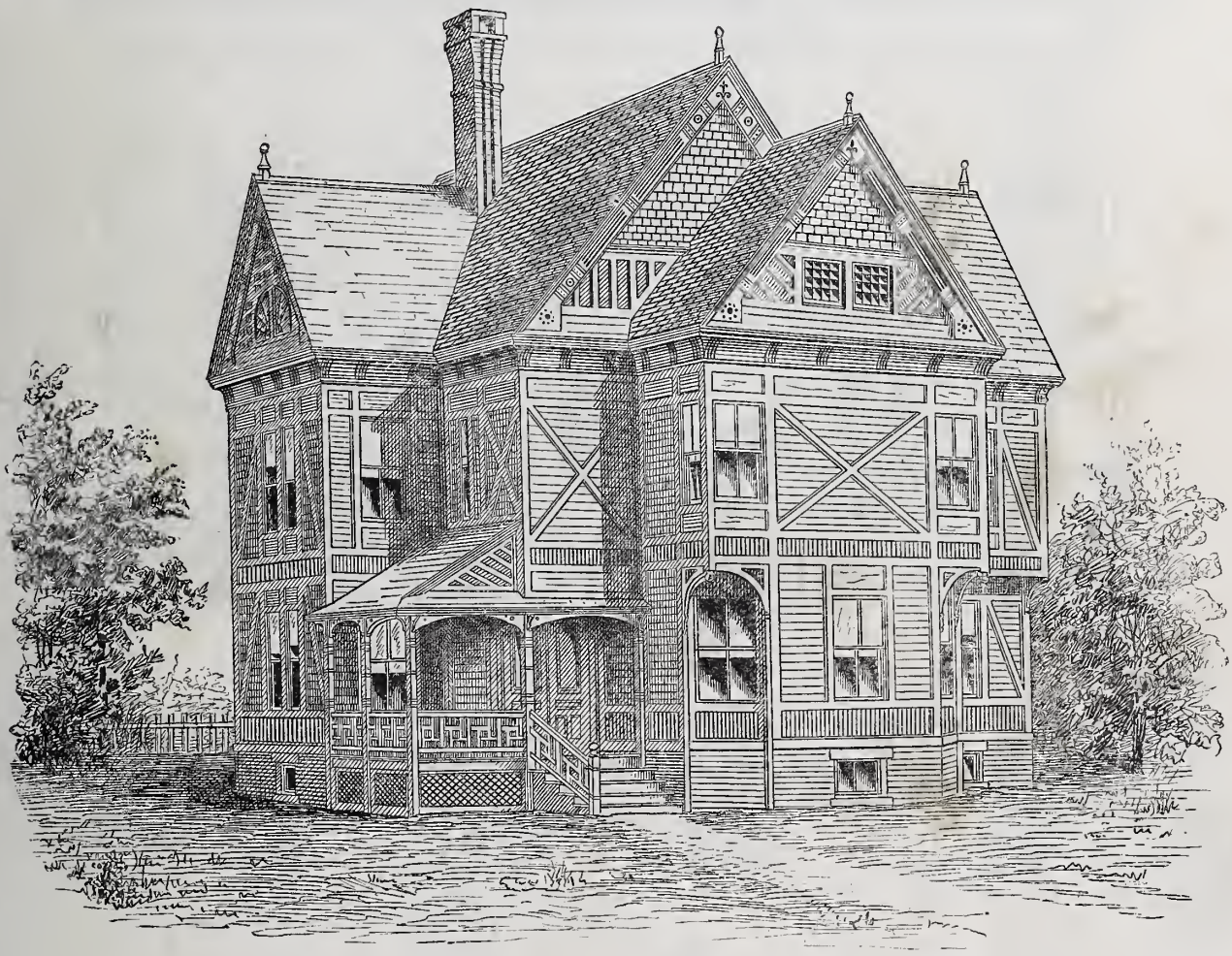
CARPENTRY AND BUILDING

A MONTHLY JOURNAL.

VOLUME IV. NEW YORK = MARCH, 1882. NUMBER 3.

Design for a Frame House.

The house presented to our readers this month, the illustrations of which occupy this and following pages, combines many features which are at present quite popular, and isolated examples of which may be found in the work of various architects. Mr. Walker has produced a very happy combination, and has arranged a dwelling which, for compactness and economy of space, will bear study. The leading feature of the planning is the stairway in the middle of the house and the rooms arranged around it. The entrance hall projects upon the piazza and is lighted by three narrow windows. From it access is had directly to the dining-room, and, by passing through the staircase hall, to the parlor and sitting-room. One stairway is made to serve for all purposes. It is approached from the kitchen through a passageway under the stairway. Space for a wash-basin is provided in this passageway. Passing to the second story, it will be noticed that three good chambers are provided, nearly square in general shape, communicating with each of which is a large clothes press. The bath-room is so placed as to make the necessary plumbing in the house compact. The basement plan, which is shown in Fig. 6, indicates that the designer intended the house to be heated throughout by a furnace. One chimney only is provided. The architect's intent in the arrangement of the floor plans here presented was to produce a cheap house, and one withal very convenient and somewhat showy. The engravings presented so thoroughly show his efforts that, without further explanation, we leave the subject with our readers.



Frame House, Designed by W. Howard Walker, Providence, R. I.—Fig. 1.—Perspective View.

SPECIFICATION.

The following abstract of the architect's specification accompanying this design will be sufficient to enable any of our readers to build this house, or to prepare full specifications according to the requirements of the case. The excavation for the cellar is to be 5 feet below the grade of the lot. The foundations are to be composed of good ledge stone, extending 6 inches below the cellar bottom, and to run under all interior walls. The foundations are to be placed on footing stones 12 inches below cellar bottom under all outside walls. From the footing stones to a line 6 inches below grade of lot, an 18-inch dry wall is to be built. Solid stone foundations are to be provided for the chimneys. On the top of the foundation walls thus constructed, build up brick underpinning walls 8 inches thick and 3 feet above grade, using for the purpose good hard brick laid in lime and cement mortar. The division walls and cellar walls are to be built of brick of good quality, laid in lime and cement mortar. The chimneys from the cellar bottom to their tops, as shown upon plans and elevations, are to be laid of good, hard brick, with lime and cement mortar. Above the roof line the chimneys should be laid in red mortar. A cold-air duct, as shown on cellar plan, should be built below the cellar foundations. The sides are to be bricked up, the bottom to be cemented and the top to be covered with 2-inch stone flagging. The bottom of this duct is to be 18 inches below cellar bottom. Cement the cellar bottom with a good hydraulic cement and gravel 3 inches in thickness.

Frame the house from good, square-sawed hemlock timber of the following general dimensions: Sills, 3 x 6 inches, posts, 4 x 6 inches; door and window studs, 3 x 4 inches; intermediate studs, 2 x 4 inches, placed 16 inches between centers; floor joist for first and second stories, 2 x 9 inches; and for the third story 2 x 8 inches, placed 16 inches between centers; plate, 4 x 4 inches; girts, 4 x 4 inches; rafters, 2 x 7 inches; hip and valley rafters, 3 x 8 inches; piazza rafters, 2 x 6 inches. All rafters are to be framed 2 feet between centers. The entire frame is to be covered with good hemlock boards ⅞ inch thick and well nailed. Under floors are to be laid in the first and second stories from similar material. All outside trimmings are to be made from clear white pine free from sap and large knots. The piazza floor to be of 1⅛-inch Southern hard pine, laid in strips 4 inches wide and with ¼ inch open joints. The gutter will be formed in the roof, as shown on detail section, and is to be lined with best quality roofing tin. The roof is to be covered with shingles of the best quality shaved Eastern cedar, laid 4¾ inches to the weather and secured by two nails to each shingle. The shingles in the gables to be 4½ inches wide, with corners cut and laid with plumb-joints. The clapboard used to be Eastern sawed white pine 4 feet long,

laid 4¼ inches to the weather and nailed every 10 inches. All nail heads to be carefully set. The ceiling of piazza to be narrow matched and beaded pine strips ½ inch in thickness. Lead or painted tin fastenings

second-story doors are to be of the same thickness, 2 feet 10 inches by 6 feet 10 inches, having four molded panels. Attic doors are to be 1⅜ inches thick, 2 feet 8 inches by 6 feet 8 inches in size, with raised panels. The out-

brass bolts on standing door. Other doors to be hung with common butts and to have latches and knobs wherever necessary. The bathroom is to be ceiled up 4 feet high with narrow matched and beaded black walnut

Frame House.—Fig. 2.—Front Elevation.—Scale, ⅛ Inch to the Foot.

are to be used over all windows, and wherever necessary to make weather-tight joints. Sash are to be 1⅜ inches thick, closed with first quality French sheet-glass. Outside blinds are to be furnished to all windows in the first and second stories, except the small windows in the front and back halls of the first story. Blinds also are to be furnished to the windows in the rear gable.

The interior partitions are to be run as shown in the floor plans. Studs 3 x 4 inches will be used for all doors and 2 x 4 inches for the intermediates. The latter are to be placed 16 inches between centers, and are to be carefully cross-bridged half way up the hight of every partition. Cross-fur all ceilings with ⅞ x 2 inch furring strips. The upper floors, including attic, are to be 1 inch spruce, planed and matched, well laid and strongly nailed. A floor is to be laid in the laundry and laundry closet. The stairs are to be built of clear white pine, 1⅛-inch treads and ⅞-inch risers. The newels, angle posts and balusters are to be of black walnut. The rail and posts to stairs from kitchen to cellar to be of white pine. The interior finish throughout to be of good, clear white pine. Doors in the first story to be 1¾ inches thick, 3 feet wide, 7 feet high, with four molded panels and molded middle rail. The

side front doors are to be 2¼ inches thick and of the size shown on elevation. The top panels are to be closed with ground and

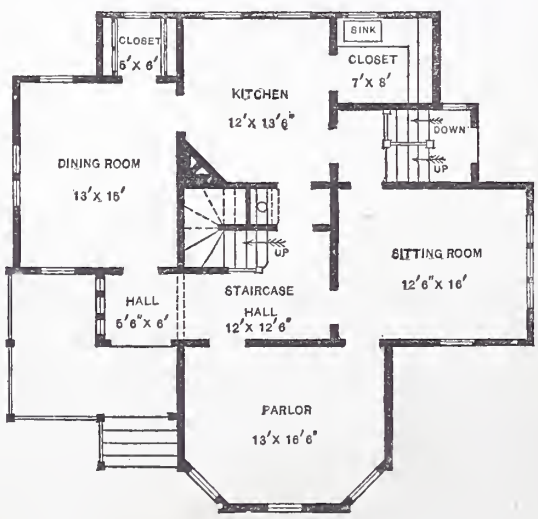


Fig. 3.—First Floor Plan.—Scale, 1-16 Inch to the Foot.

cut glass. The front doors are to have japanned butts, to be provided with lock and night latch combined, bronze knob and two

strips. The bath-tub, basin and water-closet cabinets and basin cabinet, under stairs in first story, are to be of black walnut, to be thoroughly kiln-dried. Kitchen and dining-room closets are to be finished in white pine and to be provided with shelves. The shelves in dining-room closet to be protected by glass doors. Thresholds to all inside doorways are to be ¾ inch in thickness and of cherry or birch.

The walls and ceilings of all rooms in first and second stories and attic are to be plastered two coats, the second coat to be rubbed smooth. Hard finish the ceilings of all rooms in first and second stories. Run stucco cornice on all principal rooms of first story, kitchen excepted, and on the hall of first and second stories. Put up stucco centers on the ceilings of the three principal rooms in the first story and of the four chambers in the second story.

Paint all the exterior woodwork of the house, excepting the roofs, with two coats of pure paint made from stone yellow, lamp black and india red, thoroughly mixed with linseed oil and of such shades as shall be desired. Putty-stop all nail heads and cracks between the first and second coats. Paint all tinwork with two coats of pure red lead and oil. Draw all window sash two coats, the outside in india red and the inside to match rooms.

Red stain the pulley stiles of all windows. The piazza floor to bo finished with two coats of raw linseed oil. Paint the interior woodwork two coats, using pure lead, oil and turpentine in such colors as may be desired. Between first and second coats sandpaper all woodwork and putty-stop all nail heads and cracks. The hard woodwork of stairs, bathroom and cabinet under stairs to have four coats of gum shellac and to be polished down in pumice-stone and oil. The outside blinds to be painted two coats of a color to suit the owner.

Frame House.—Fig. 4.—Side Elevation.—Scale, ⅛ Inch to the Foot.

Automatic Sprinklers for Fires.

The recent terrible fire in the Ring Theater in Vienna, in which nearly one thousand persons lost their lives, has caused public attention to be turned very generally to the subject of fire protection for buildings of all kinds. In the Ring Theater the usual means for extinguishing fires appear to have been provided. There was a quantity of hose, and sprinkler pipes were in position. The rapid work of flame and smoke, tho demoralization of the employees, and tho crookedness of tho means of exit, all aided in producing a disaster of most appalling magnitude. The wilderness of combustibles upon a theater stage is something hardly dreamed of by any spectator in front of the stage, and it is little wonder that theater fires are so destructive. The wonder is, in fact, that they are not more frequent. A recent factory fire in Philadelphia in many respects recalled that of the Ring Theater, and there were not a few points of resemblance. One of these was the fact that the stairways were crooked and narrow. The masses of combustible material seem in both cases to have been equally great. Everywhere in the manufacturing cities we find wooden floors and stairways, rooms separated by wooden partitions, paper and paper boxes stored where they become like tinder, doors opening inward at points of exit, stoves and furnaces with their pipes aiding the woodwork to become more and more like tinder, and in general a resemblance to theater conditions which is startling. It is useless to talk of a change of construction while insurance can be effected upon buildings of this character.

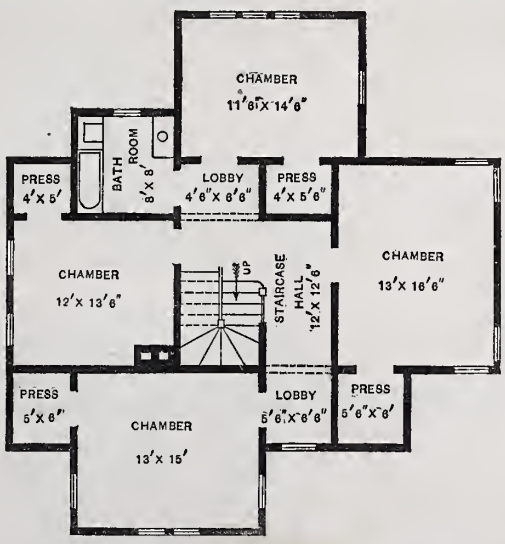


Fig. 5.—Second Floor Plan.—Scale, 1-16 Inch to the Foot.

We think that the theaters can be made safe, and we are sure that even wooden staircases and elevator shafts may be protected against fire, and that, too, without any very serious expense. Wo do not, however, think that the means commonly relied upon for protection are of any great value, either in the theaters or factories, from the fact that too many of them depend upon the bravery and courage of the employees. It is too much to ask a man upon ordinary wages to stand and fight fire when he knows that there is a tinder-box between himself and safety, and that at any moment a drifting spark may cut off his only chance of escape. This was the case in the Vienna theater fire, and it is the case in many of our factory fires in this country. Yet it has more than once happened that those who have stayed to fight the fire have paid for their bravery with their lives, a warning to others not to endanger their lives in similar efforts.

Some years ago an invention was mado that put into the manufacturer's hands a means of fighting fire which is of most exceptional value. We refer to the automatic sprinkler. Simple sprinkler pipes have long been in use. They consist of perforated pipes laid along the ceiling of rooms, so placed that when water is let into them they will wet down the

whole or any portion of a room over which they are put in operation. These, like other fire apparatus, had to be controlled by some one familiar with the uses of the valves and the pipe system. Holes were rusted up and wrong pipes were often opened, so that this method of fighting fire has by no means met the expectations of those who have used it. The automatic sprinkler is of a different character. It consists of a nozzle calculated to throw a spray of water for some distance around it. This nozzle is closed by a cap soldered on with a solder which can be made to melt at any desired temperature, very commonly 155° F. If the cap is subjected to this heat the solder softens; the pressure of water in the pipe to which the nozzle is attached throws the cap off and the water in a spray is discharged. In systems of protection where these sprinklers are used, the pipes are arranged along the ceiling and the nozzles inserted at regular intervals. The effect can at once be understood. If a fire starts in any portion of a room thus protected, the heat will at once start the sprinklers in that portion of the room into operation. The speed with which some of the different makes of sprinklers operate is startling. In some cases, when exposed to heat as a test, they have started in something like a quarter of a minute; in actual work they have been in operation in less than three minutes.

The application of this system to theaters is too obvious almost to need a description. Lines of sprinklers should be placed over the rigging loft, along the borders, over the drops, over lines of gas burners and over the combustible portions generally. In the roof the whole area should be covered by them.

Fig. 6.—Basement.—Scale, 1-16 Inch to the Foot.

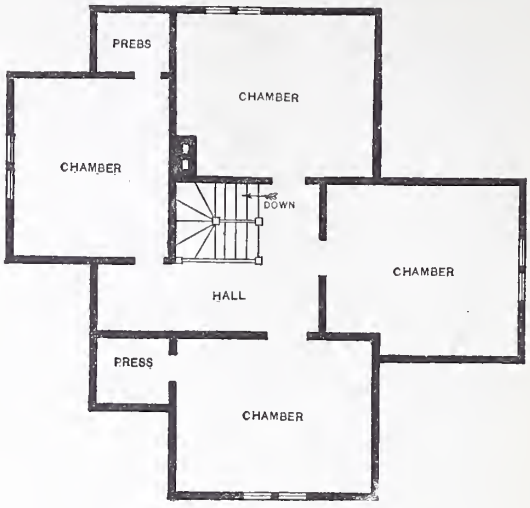


Fig. 7.—Attic.—Scale, 1-16 Inch to the Foot.

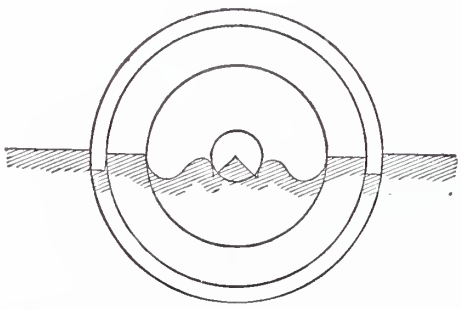


Fig. 8.—Detail of Rosette on Porch Post.—Scale, 3 Inches to the Foot.

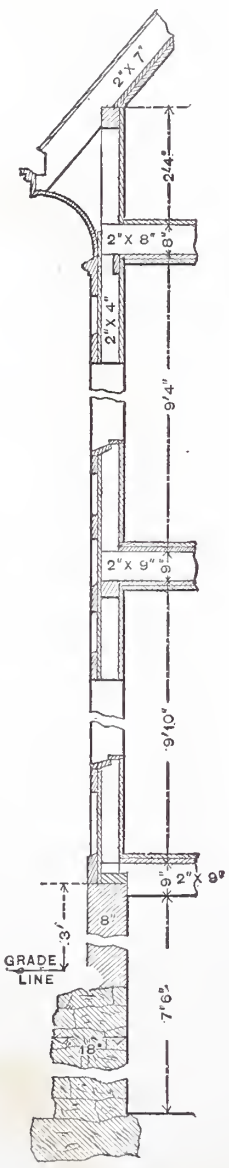


Fig. 9.—Section Through Side Walls.—Scale ¼ Inch to the Foot.

Fig. 10.—Porch Post and Rail.—Scale, ¾ Inch to the Foot.

Lines of sprinklers with hose connections should be used to raise and lower like lines of gas pipes. Automatic sprinklers are always kept under pressure from a tank upon the roof; into this tank fire engines can play by means of ground connections.

With this system, as soon as a fire starts a stream of water begins to play upon it. In fact, the first rush of heat from a flame below will open the sprinklers. Sometimes these sprinklers have promptly operated after they had been in position for years. With a stairway defended by automatic sprinklers there would be little or no danger of having the escape of the workmen cut off from an upper story. An elevator shaft would not be such a source of danger as it is at present if fitted up in this way. The rooms in which an unusually combustible class of goods is stored may be made comparatively safe with a carefully arranged system of "automatics," as they are called by those familiar with them. Fire-doors can be shut automatically by a weight, which is released by the melting of a piece of the very fusible solder employed for fastening on the caps of the sprinklers. So sensitive is this solder that a fire-door has been made to shut by holding a lamp some distance beneath the soldered link and holding an open handkerchief between the lamp and link. Though the handkerchief was not charred, hot air enough had reached the metal to fuse the solder and allow the apparatus to start into operation.

A HOUSE WAS recently contracted for at Grand Island, Neb., the specification being "according to plans and specifications in *Carpentry and Building* December number for 1881." Our correspondent says this is the first occasion he has ever known of a magazine plan being used in this manner. He considers it a deserved compliment to this journal.

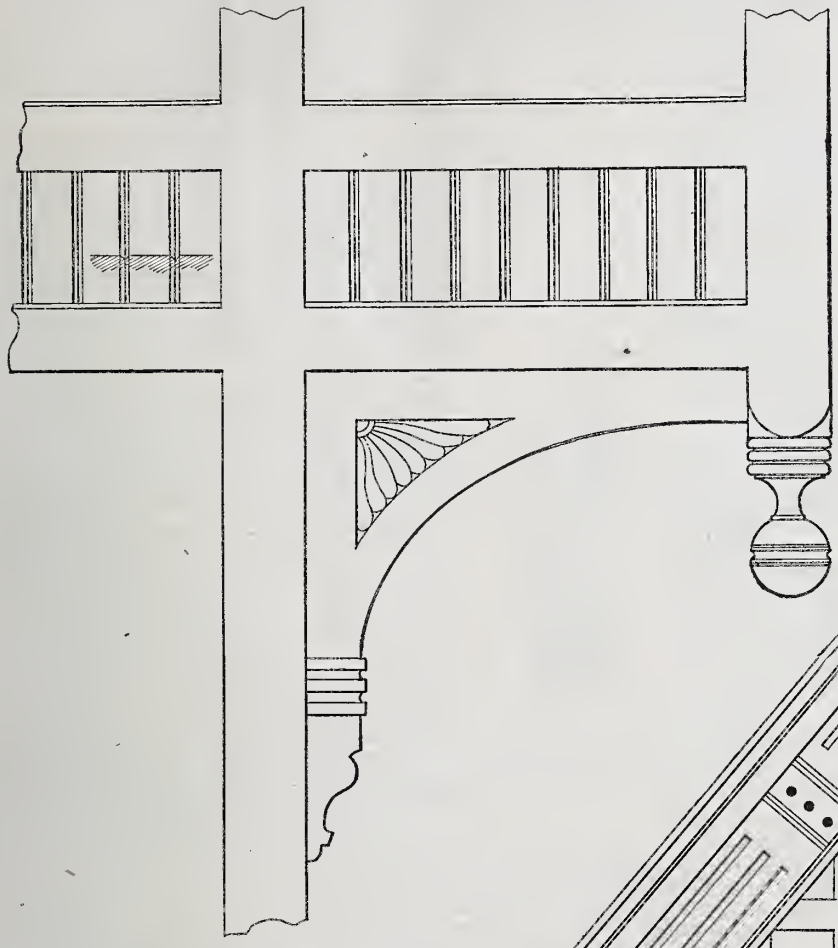


Fig. 11.—*Detail of Overhanging Corner to Parlor.—Scale ¾ Inch to the Foot.*

Fig. 12.—*Elevation of Side Gable.—Scale, ½ Inch to the Foot.*

The Glue Pot.

That indispensable article to every well-regulated factory and cabinet shop, the glue pot, says a writer in an English paper, is seldom understood. How common is it for the young artisan or apprentice to fall into the error of thinking that glue is King Cure-All, regardless of the application! In the first place, the article used should by all means be a good one, of which every practical mechanic should be a judge. It should then be dissolved in a proper manner and to the proper consistency or body, according to the work to which the application is to be made. Now comes the point at which there is a great majority of the failures; and the difficulty is not so much with the glue or application as it is in the preparation for the same. In other words, be sure that you are ready by having tried the work together, before you take the glue brush in hand. And if the work is mortise and tenon, you have made a failure that is not easily remedied if you have made the tenon too small either in thickness or width to fill perfectly the space in the mortise. To guard against this error know what you are doing.

When you are cutting the mortise and tenon, let it be either by hand or machinery; and when the glue brush is taken in hand

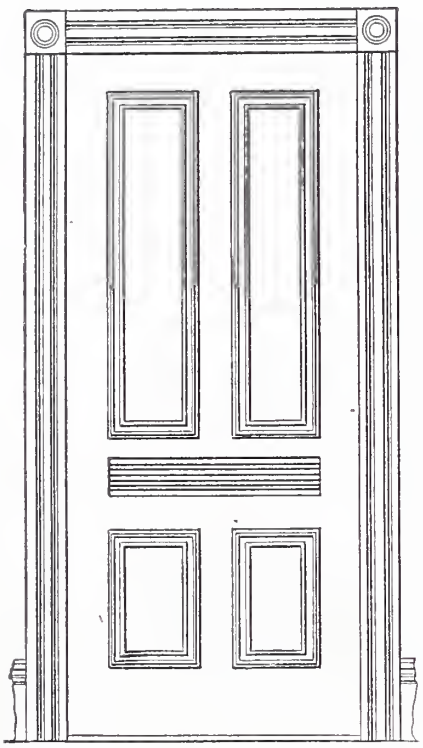


Fig. 13.—Elevation of Doors in First Story. Scale ½ Inch to the Foot.

these general rules should always be observed, no matter what may be the character of the work: see that the temperature of the room is warm; if in cool weather, use artificial heat to bring the thermometer to 70° or 80°, if you can conveniently do so. But this depends entirely on the nature of the work. As to how much time must of necessity be consumed between the first spread or application and the final set—not to be any more at the joints moved until the work is dry—that time should always be brought down to the shortest period, if the nature of the work is such that it must of necessity take time to get the work together.

The great objection of chilled glue should be avoided by getting the wood to be glued first warmed up and having your glue boiling hot. And here it would be proper to add that every factory that has much gluing to do should have a small room for the special purpose, where the temperature in cold weather could easily be brought to a high point. In making nice work that is mortised and tenoned together, the face of the work should not be dressed off for several days after being put together, for this reason: dissolved glue contains a large percentage of water. The glue joint dries by the wood absorbing the water from the glue, and hence must of necessity expand the fibers of the wood coming in close contact with it, and if dressed off in this expanded condition, that part must dry out, although it takes time to do it, as the moisture cannot escape except through the pores of the wood. And upon the same receiving a high polish in the finishing-room you will see a sunken place 20 feet off right over the tenons that were

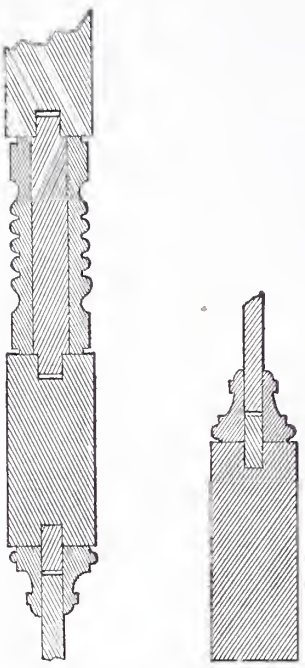


Fig. 14 and 15.—Detail of Middle Rail and Stiles of Door.—Scale, 3 Inches to the Foot.

dressed off in the wet or uncontracted state. This same rule is applicable to joints in the edges of boards that are glued together. The tongue-and-groove joint becomes more expanded than the square joint, and hence takes longer to dry out, from the simple fact that it takes more glue.

There is a difference of opinion in regard to making edge joints in boards. Some advocate the rub joint, both pieces of which are made perfectly straight and set on with out clamps. But I have always advocated the sprung and clamped joint, from the fact that I don't believe glue to be intended to fill vacancies larger than the pores of the wood; and I hold that it is an impossibility to make a perfect joint without the aid of pressure, and a heavy pressure at that. Now, what is

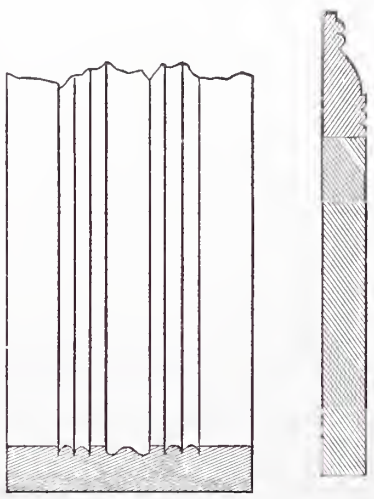


Fig. 16 and 17.—Detail of Architrave and Baseboard.—Scale, 3 Inches to the Foot.

the advantage of the clamp? Simply this, to mash down those little high points, perhaps too small to be seen with the naked eye, but under the microscope they are visible and many. This little instrument comes in well under the head of wood-filler, about which much can be said. But that is not the subject in hand. To return again to the clamp; use strongly in mortise and tenon as well as in edge joints. For example, put up a table frame without glue; put on all your clamping power, take the same apart and examine for the indentations in the legs surrounding the mortise, where the high points of the tenon shoulder have buried themselves in the side grain, that being softer than the end grain on the shoulder. It is the little things that make up a good character. It is also the little things in mechanics that make up a good job.

Terra-Cotta Lumber.

A number of our exchanges recently have contained an account of a patent process for making lumber for terra cotta. Why the product should be called lumber is more than we can tell, unless it be that the material thus produced is of a character to be put in place with nails instead of cement or mortar. It is true a saw is to be used in producing the shapes which may be required, but after all this is said there are very few characteristics which it has in common with lumber. The account closes by the assertion that fireproofing hereafter will be the work of carpentry, instead of masonry as heretofore. As being of interest to our readers, we will give a brief abstract of the process by which the material is made. The composition consists of kaolin clay free from grit, resinous sawdust and water. Two to three parts of sawdust are used to one of clay, according to circumstances, and enough water is employed to incorporate these ingredients into a plastic mass by the aid of machinery. Removed from the grinding tubes, where it has been ground, the spongy product is forced by plungers driven by steam through iron or steel cylinders to expel the superfluous moisture. It issues forth in the shape of long blocks, of length, form and size best fitted for handling. When sufficiently dry to render handling safe, these blocks are moved into kilns constructed for the purpose. The steam and vapors are driven out by a slow, steadily increasing fire. The temperature is finally brought to a white heat, which not only consumes the sawdust, but brings the clay itself into the first stages of vitrification. On cooling, the logs are removed to the mill and sawed into planks, boards and dimension stuff, as lumber from wood is manufactured, and subsequently fashioned in the workshop into such articles as are demanded by the purchasers. The account adds that the material, being free from grit and tough in texture, it may be worked with edged tools, and after being fashioned it may be submitted to a second fire, in which a glaze is added, thus producing a fine ornamental appearance.

Defects in Education.

In his annual address before the California Academy of Sciences, the president, Prof. Davidson, dwelt upon the advantages of the introduction of elementary science in the public-school system, and upon the formation of schools of trade, art and commerce. He believed that the present school system had spoiled tens of thousands of artisans, but in this respect it has in a measure only repeated the experience of other countries. To state its results mildly, it may be said to have created a disposition in the pupils to avoid those occupations which demand manual labor, and seek those easy berths where some one else must do the work. It creates a false standard of manly merit. Whoever has had a varied experience with young men grown up from the ordinary public schools, will be astonished at their lack of knowledge of the fundamental principles which underlie their workmanship. They have, in general, an amount of undigested, incoherent material which their teachers have christened knowledge, and which their own experience considers applicable for any and every pursuit. One of the commonest shortcomings of young people throughout the country is their inability to draw upon paper the simplest objects. Very few of them could lay down a map of the roads with which they are most familiar, or make a sketch of the plainest machine of the

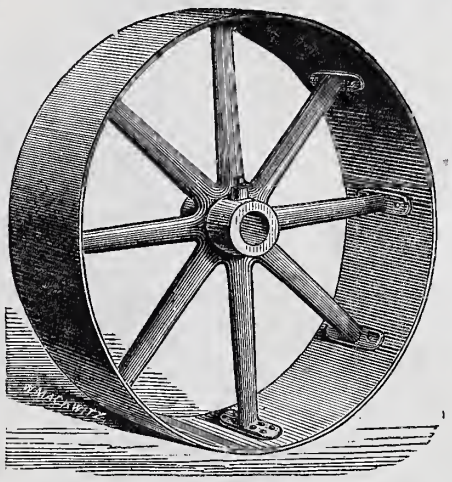
day, and much less convey upon paper any idea which looks to an improvement or an invention in machinery or construction. Prof. Davidson felt safe in saying from his experience that not one person in a hundred from the public schools can give an off-hand drawing of any plain object with an approachable degree of accuracy as to relative dimensions and perspective. This he did not think was the fault of the pupils, but rather the inherent weakness of the system. He took it as an evidence that this country is not doing its duty to its boys. It is not necessary to cram the young men, who are to build up the industrial supremacy of this country, with foreign languages, which in a few years must be pressed aside before the irresistible progress of the English-speaking races. It is a thousand times better that the boy who is to honestly earn his livelihood as an artisan should be a fair draftsman than a fair musician. The speaker praised the musical faculty, which he believed, wherever it existed, should be cultivated, but, he said, "do not spoil a good carpenter to make an indifferent musician." The classics, music and the fine arts have their high places and their harmonizing functions in modern civilization; so, too, has the bridge builder, the miner, the engineer and the contractor. Each year the demand for skilled labor increases, and the difficulties of the problem of education multiply. The deficiencies in the present system cannot be corrected at once. Time is required to mold and develop a proper system of trade and art schools.

Exhibition of Building Materials.

The new department of the Museum of Natural History of this city, to be known as the Economic Department, has reached a stage where it seems to be an assured success. Mr. Morris K. Jessup, a public-spirited citizen, who made provision for the endowment of such an institution at a cost of $15,000 to $20,000, has put all who are interested in building matters under lasting obligations. The new department is to be a permanent exhibition of building materials, and is promised to be more complete than anything else of the kind in the world, except, perhaps, that at the Kensington Museum, England. The lack of proper accommodations for the new department in the regular buildings of the Museum of Natural History, has been supplied by the Park Commissioners consenting to the use of a floor for the purpose in the Arsenal Building in Central Park. The formation and arrangement of the new exhibition will be under the direction of Professor Sargent, of the Smithsonian Institute. It is hardly possible to overestimate the advantages of such an exhibition to young engineers, students of architecture, mechanics, and all who are interested in building. It will supply a want long felt in this country, and this object will be accomplished by the only means possible for the purpose. Some of the industrial fairs of the country, notably that of the Massachussetts Charitable Mechanic Association at Boston last fall, have tried to serve the building public in this direction, but all such efforts have failed by reason of the apathy of dealers in and manufacturers of all kinds of building materials and supplies, except only those having patented specialties, or goods in which a business was lacking that might be induced by judicious advertising. While the recent exhibition at Boston was in some respects the best of the kind that has ever been held, it was notably deficient in many particulars, and fell far below the sanguine hopes of its projectors. With the building business as brisk as it was during the past year, and with dealers in all kinds of building materials put to it to fill orders rather than to find trade, there was no inducement for them to exhibit staple articles such as stone, brick, cement, lumber, glass, doors, sashes, &c., and yet these items are far more important to the student than patented systems of fire-proofing, methods of heating and ventilation, power elevators, patent skylights and the like, which were the most conspicuous features of the Boston exhibition mentioned. Nothing short of a private endowment or the appropriation of public funds can accomplish the end in view, and we are pleased to know that so happy a beginning has been made in this direction.

Stimulating Improvements.

A Scotch firm, with works at Dumbarton, began in August 1880 an interesting experiment which has been watched with much interest. They offered liberal rewards to such of their workmen as would invent new machine or hand tools, improve existing tools or make other discoveries and applications which, upon investigation, should be found to improve the quality of work in their establishment or cheapen its cost. The results of the past year were so satisfactory and called out so many new and good ideas, that the firm have been encouraged to continue their offer with some modifications. In future, should an invention be considered worth more than the standing reward, £12, the firm will pay more for it, or, if of sufficient merit, assist the inventor in completing, patenting and disposing of it, in consideration of the right to use it themselves without royalty. This idea is a good one, and might be adopted with advantage in every large and liberally-managed industrial establishment. Its effect upon the workmen cannot be other than beneficial, in stimulating them to study the machines and tools they work with and to acquaint themselves with the "state of the art" they practice by reading and inquiry. Whatever interests a man in his work and his tools, increases his value as a mechanic. It is not probable that the stimulus of a reward would call out any revolutionary inventions, but these are rarely made, and perhaps in the end contribute less to mechanical progress than the countless minor improvements made from month to month in plant and processes. We should like to see the experiment tried under favorable conditions in this country.



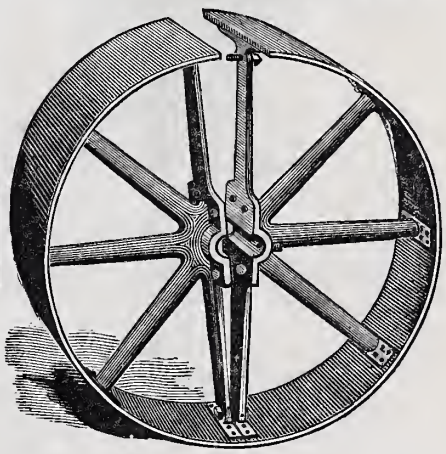
Novelties.—Fig. 1.—The Medart Wrought Rim Pulley.

One of those terrible accidents which occasionally occur in building practice and by which men lose their lives, happened at Logansport, Ind., the last week in December. John M. Evans and Henry Wefel were employed upon the Johnson Block, then in process of erection in that place, and were upon a scaffold some 56 feet above the sidewalk. Mr. John Wefel, the architect of the building and father of one of the young men just mentioned, was also upon the scaffold at the time. Owing to some defect in construction, the scaffold suddenly gave way, precipitating the three to the pavement, killing the two young men instantly and severely injuring the third. Mr. John Wefel owed his escape to the fact that he caught hold of a scaffolding plank in his fall, thereby breaking the force. He escaped with a fractured arm and some severe bruises about the head. Our correspondent, in giving the account of the above, adds: "This should be a lesson to workmen generally not to spare lumber, nails and time in building scaffolds. The two young men who thus lost their lives were sacrificed to carelessness."

NOVELTIES.

MEDART WROUGHT RIM PULLEYS.

For some time past a wrought rim pulley has gradually been working its way into use in the Western States. The value of the wrought-iron rim, or a wrought-iron pulley, over a cast-iron pulley, is pretty generally known and acknowledged. Such pulleys have been long used in England, where they are made in a great variety of styles. The Medart Patent Pulley Company, of 105 and and 107 South 7th street, St. Louis, Mo., are manufacturing pulleys of this description. The accompanying illustration shows two styles—one split, and the other with the rim in a single piece. Pulleys of this kind combine in themselves the minimum weight with the maximum strength. The rims are straight and cast in one piece, with the hub without a rim. The smaller sizes have six, the medium eight and the large sizes ten arms, the great number being an advantage in giving them a better chance to withstand strains. This construction of the pulley is such as to greatly reduce the weight, while at the same time the accuracy is said to be, in many respects, greater than that of the cast iron pulley. The rim itself is of uniform thickness and width, and as the spider is first ground concentric with the axis of the pulley, and after the rim is attached that also ground from the same center, it is said that the center of gravity and geometrical center of the pulley can be made to correspond in all cases with much greater accuracy than is possible in cast iron. The weight is usually fully one-half less than that of the lightest cast iron. This, of course, by reason of the increased strength, enables the wrought pulleys to be run at a much higher speed and to transmit a given power with much lighter shafting and hangers than would otherwise be necessary. The sizes run from 9 by 14 inches, with 1 7-16th inch bore, to 60 by 16, with 5-inch bore. The smallest pulley weighs 9 pounds and the largest one 300 and a fraction. The faces of these pulleys are beautifully smooth and regular, and it is said that the wear of belting is greatly reduced in consequence. Among the incidental points of advantage which the manufacturers mention, are the facts that these pulleys can be shipped without danger of breaking and without the necessity of boxing, and generally as third class freight, while the lighter weight makes a further reduction in the cost of transportation. The rims are cold rolled, and made either crowning or straight, as may be desired. Pulleys are also made with single or double arms. The split pulley is cut in only one place upon the rim, as is shown in the engraving, making an extremely neat job when put in position. The company carries a large stock of pulleys of the common sizes, as well as a complete assortment of spiders. The Hartford Engineering Company, of Hartford, Conn., are, we believe, the licensees for most of the Eastern States.

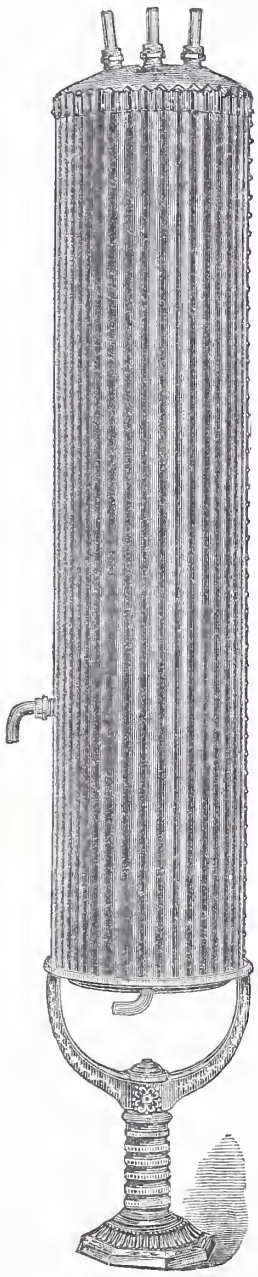


Novelties.—Fig. 2.—The Medart Wrought Rim Split Pulley.

CORRUGATED RANGE BOILER.

Messrs. R. Estabrook & Son, of 198 Second street, South Boston, Mass., are manu-

facturing the corrugated range boiler illustrated in Fig. 3 of the engravings. It is made of copper, tinned inside, riveted at the joints and backed with solder. Brazing is avoided, and on this account the manufacturers assert there is no risk of cracking by reason of burned metal, a difficulty sometimes encountered with boilers of the common form of construction. The special feature in this boiler are the corrugations, which are depended upon for strength and elasticity. The boilers are tested before sending out, and are warranted to stand a pressure of 200 pounds to the square inch. The peculiar form employed renders them much less liable to burst by freezing or to collapse than the ordinary plain pattern. Usage that would

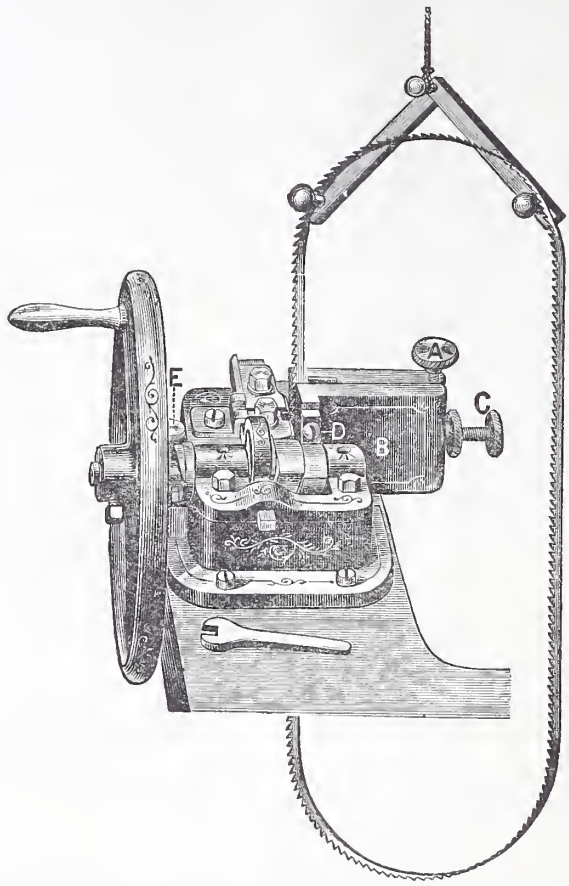


Novelties.—Fig. 3.—Corrugated Range Boiler.

cover the common boiler with dents and disfigurements, the manufacturers assert, is hardly shown upon this article.

BAND SAW SETTING MACHINE.

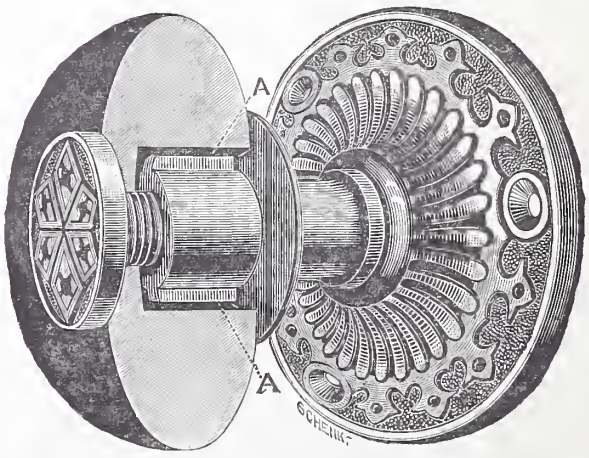
Messrs. G. W. Amesbury & Co., of 3101 Chestnut street, Philadelphia, are introducing the band-saw setting machine represented in Fig. 4. In its design and construction this device embodies new principles, and is said to possess all the good features of hand work in combination with the speed and regularity of machine work. To properly set the teeth of a band saw, the blade should be clamped firmly as in a vise. To hold the saw in position by passing it through slots which must be open enough to admit the easy passage of all the thickest parts is not sufficient, because the blade will yield back and forth with the action of the dies against the teeth, and as the blade varies in thickness, so will the set vary in the teeth. To produce an even set the pressure on each tooth should be the same. The action of an arm in moving a lever back and forth is spasmodic, and the force of the blow or pressure on the teeth varies. Accordingly a circular motion has been found to be most desirable for this purpose. The use of a fly-wheel insures even and uniform work at all portions of the stroke. These features are embodied in the machine we illustrate. It is arranged to work by an easy, uniform crank motion, and when the tooth to be set is fed into position, the blade is firmly locked between the steel jaws of a vise, and remains immovable while the tooth is set to any degree required. As the crank goes forward the blade is released, when the next tooth is fed up to the dies, the blade again locked in the vise, and this tooth set in the opposite direction. All these movements are automatic, and can be carried on at a speed of 300 teeth per minute. The feeder picks up only the tooth that is to be set; consequently each tooth is fed to its proper position, regardless of their irregularity. In using the machine the band saw is simply hung up on a wooden bracket, as shown in the engraving, and the lower part left pendant near the floor.



Novelties.—Fig. 4.—Amesbury Band Saw Setting Machine.

AN IMPROVED DOOR KNOB ATTACHMENT.

We show in the accompanying illustration a new door-knob attachment introduced by the Clark Mfg. Co., of Buffalo, N. Y. It is designed to afford a better method than any now in use for securing door knobs to their shanks, and dispenses with the use of lead. As shown in the cut, the shank of the knob is provided with wings or lugs (see cut at A A), which fit into grooves made in the knob, and effectually prevent it from turning on the shank. The rear end of the shank is provided with an internal thread to receive the threaded stem of the button, which is screwed up against the knob by inserting a screw-driver through the opening in the shank, and cannot be operated from the outside, thus making a perfectly secure and ornamental device.



Novelties.—Fig. 5.—An Improved Door Knob Attachment.

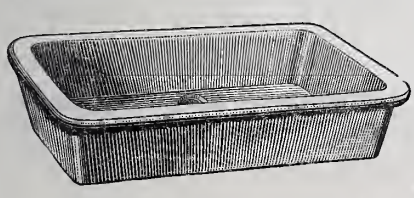
CERAMIC SINK.

Every one who appreciates sweet and clean kitchens is interested in improvements in the way of the appliances used therein. The superiority of slate and iron sinks and wash-

tubs over the ordinary articles made of wood is readily admitted, but even better goods than these are to be found in the market. On page 46 of our volume for 1879 we described stationary white crockery wash-tubs, made by the Morahan Ceramic Co., whose office is at No. 20 Vesey street, this city. This article having been eminently satisfactory, the firm have recently put upon the market a kitchen sink made of the same general material and possessing the same features, an illustration of which is given in Fig. 6 of the engravings. The advantages of such an article readily suggest themselves to the mind of the reader without the necessity of enumeration, but still some of them may be mentioned. Being of pure crockery throughout, there is no liability of chipping or of the coating wearing through. Articles of this kind furnish no lodgment for water bugs, and are free from smell. They are very readily kept clean and sweet and are very durable.

PRESCOTT'S DOOR HANGERS.

Every one who takes pleasure in neat and compact construction, and who appreciates easy-working sliding doors, will be interested in the Prescott Hangers, one form of which is shown in Fig. 7 of the engravings. The parts are so clearly shown in the illustration that a brief description will make the device intelligible. The levers are fixed at the bottom, (L and K) and are connected with each other by the center rivet, I. One arm, K, is attached to the back edge of the door stile and serves to carry its weight, while the other, L, is attached to the stud immediately back of the casing and forms a fulcrum. The upper end of one arm, A, is connected with the lever which carries the balancing weight, H, and moves freely, while the other, by means of the friction wheel, G, shown in position, moves up and down as the door is moved backward and forward and conveys motion to the system of levers while maintaining the balance of the door. It is obvious by the construction shown that the door is counterpoised in all positions. This is so fully accomplished that it is a surprise to put the hand upon a heavy door and find that it moves so easily as it does. The mechanism is entirely out of sight. The parts composing the hanger are all clearly shown in the illustration, from which it will be perceived that they are of the simplest form. The means of applying the device to a door are not at all difficult, the main requirements being stability of the parts to which the levers are attached, and correctness of lines and angles. The hangers are made both right and left-handed, and may be applied to old buildings



Novelties.—Fig. 6.—Ceramic Sink.

in cases where the pockets are wide enough to afford space required by the levers. The hanger shown in the illustration is designed for use only on doors that move between the walls of a double partition. Besides this form, hangers are made upon the same general principle suitable for barn doors, doors to freight cars, and for various other purposes. Very complete directions are furnished for putting the hangers in place, so that carpenters who have never seen the article in use are at no disadvantage in applying it. The manufacturers are The Prescott Manufacturing Co., 237 Washington street, Boston, Mass.

NEW PUBLICATIONS.

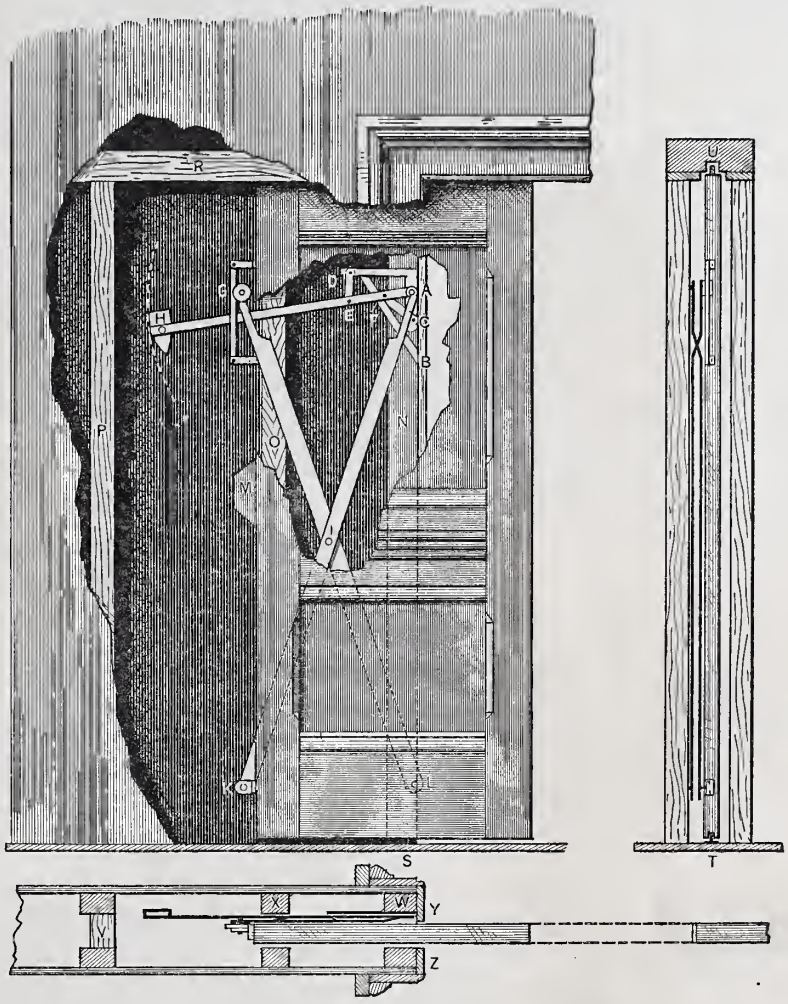
WOOD CARVING. Being No. 3 of the Art Work Manuals edited by Charles G. Leland. Published by The Art Interchange Publishing Co. Price 30 cents.

The Art Interchange Publishing Co. commenced some time since the publication of a series of Art Work Manuals, edited by Mr. Charles G. Leland, director of the public industrial schools of Philadelphia. The present number is the one issued for December last year. It contains some twenty pages of text and a largo lithographic sheet of designs, directions for treating which are contained in the pamphlet. While there is much in this work to commend, it is open to the same objection that almost all works on wood carving are liable to, and that is that it commences the consideration of the subject several steps in advance of the beginner. As we attempted to show in a series of articles on wood carving, published in our volume for last year, the art resolves itself into two parts—one, of designing or thinking in the solid, and the other, of working out the figure or pattern thus conceived by means of carving tools. A conspicuous defect in the present work is that it does not give enough attention to the design or the method of obtaining the pattern by which to carve. Its mission seems to be to describe the method of using carving tools and of applying certain geometrical figures in the flat to the surface of the wood to be cut. Several pages at the close of the book are devoted to a consideration of stains for wood by which certain effects can be obtained. Filling wood and enameling wood are also treated briefly. Three pages are devoted to suggestions of subjects for work in which we find mentioned boxes, cupboards, cabinets, brackets, chairs, stools, drawers, panels, &c.; also a number of small objects like paper-knives and parlor ornaments.

THE CARPENTERS' AND JOINERS' HANDBOOK. Containing a complete treatise on framing hip and valley roofs, together with much valuable instruction for all mechanics and amateurs, useful rules, tables, &c. Revised edition by H. W. Holly. Published by John Wiley & Sons Price 75 cents.

This little work has been before the public for some time, and its low price, combined with its general utility, has obtained for it a large circulation. The new edition contains considerable additional matter which adds to the completeness of the book. Of the new material added we notice what is called a "mysterious splice," being a method of dovetailing two pieces of wood in a way to show the dovetail on four sides, which was published in *Carpentry and Building* for May of last year. This little work is uniform with another book by the same author, entitled "The Art of Saw Filing," which has also had a large sale.

WE HAVE examined advance proofs of two important works being brought out by William T. Comstock, and which are announced for early publication. One of them



Novelties.—Fig 7.—Prescott's Improved Door Hangers.

is entitled "Modern House Painting," and will exhibit the use of color in exterior and interior finish. It will be illustrated by twenty colored lithographic plates. The other is entitled "Interiors and Interior Details," and contains fifty-two large quarto plates by various prominent architects, with letter-press description by Wm. B. Tuthill. Both books are timely.

SOME OF THE rapid telegraph systems now coming into use employ means radically different from those in common use. Perforated paper is used in sending dispatches instead of ordinary telegraphic key. The paper is punched by attendants, as many persons working on different strips as may be required to produce them with sufficient rapidity. After the strips of paper are thus perforated they are passed with great speed between surfaces equipped with springs, which will engage and make a contact through the paper at the passage of each hole. Without going into further details, it is sufficient to say that by this means signals are made to succeed each other at the rate of more than a hundred per second.

WE LEARN THAT Mr. A. J. Bicknell, of 194 Broadway, and late of Bicknell & Comstock, has just completed the organization of a company to be called "The Builders' and Manufacturers' Mutual Benefit Association of America." The object of the Association is to furnish a benefit of one to six thousand dollars at about actual cost of insurance.

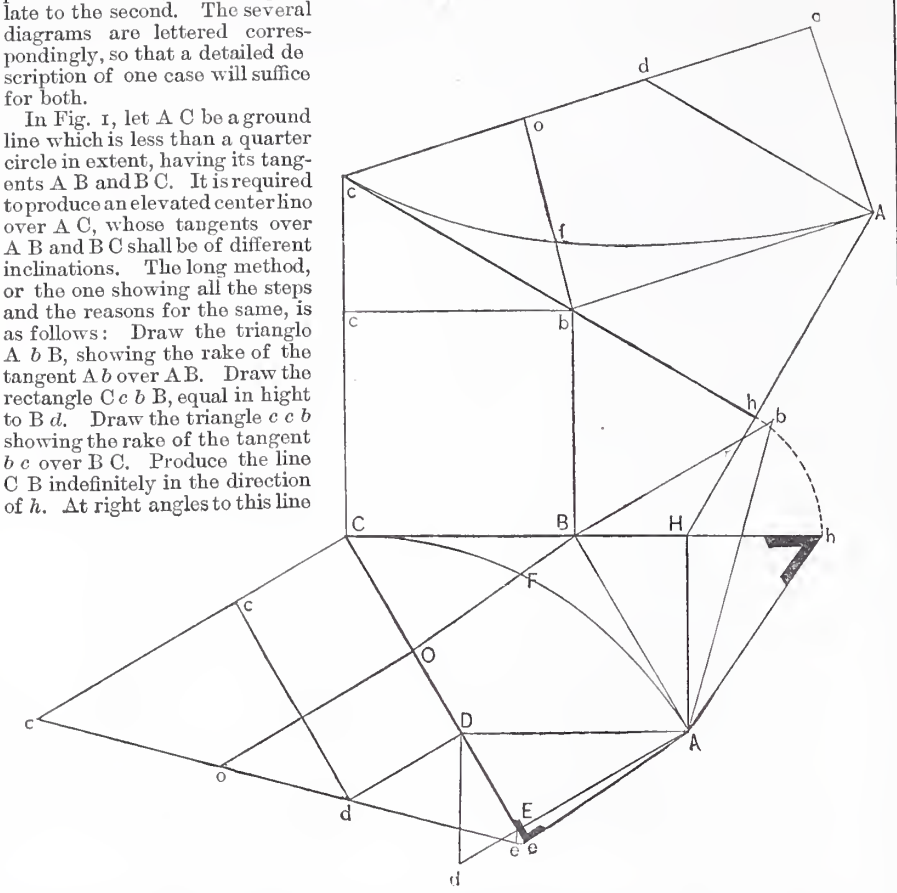
Practical Stair-Building.—XVIII.

WREATH-PIECES WHICH PASS FROM ONE RAKE TO ANOTHER OF DIFFERENT INCLINATION OVER GROUND PLANS THAT ARE LESS THAN A QUARTER CIRCLE, *and*

WREATH-PIECES WHICH PASS FROM ONE INCLINATION TO ANOTHER OVER GROUND PLANS THAT ARE LESS THAN QUARTER ECLIPSES.

Figs. 1, 2 and 3 of the accompanying illustrations relate to the first of the two problems presented above, while Figs. 4, 5 and 6 relate to the second. The several diagrams are lettered correspondingly, so that a detailed description of one case will suffice for both.

In Fig. 1, let A C be a ground line which is less than a quarter circle in extent, having its tangents A B and B C. It is required to produce an elevated center line over A C, whose tangents over A B and B C shall be of different inclinations. The long method, or the one showing all the steps and the reasons for the same, is as follows: Draw the triangle A *b* B, showing the rake of the tangent A *b* over A B. Draw the rectangle C *c b* B, equal in hight to B *d*. Draw the triangle *c c b* showing the rake of the tangent *b c* over B C. Produce the line C B indefinitely in the direction of *h*. At right angles to this line from A draw A H. Extend the rake line *c b* indefinitely in the direction of *h*. At right angles to this line and from the point H in the line C *h* already described, draw the line H *h* A indefinitely. From H, with radius H *h*, describe the arc *h h*. Connect *h* thus determined and A. On the line H *h* A already drawn, make *h* A equal to the bevel bevel line *h* A just drawn. Connect the points *b* and A, and complete the parallelogram A *d c b*. Produce *d c* of this parallelogram indefinitely in the direction of *e*. From A draw a line at right angles to *c e*, cutting the line *c c* in the point E. Complete the parallelogram A D C B. Draw the triangle A *d* D, making it equal to *b c c*. Draw the rectangle D *d c* C, making it in hight equal to D *d* of the triangle. Draw the triangle *d c c* equal to A *b* B. Through this triangle and parallel with C *c* draw O *o* in length equal to the hight B *b*. On the elevated parallelogram make *c o* equal to *c o* of the triangle. Connect the points *o* thus obtained and *b*. Make *b f* of the elevated parallelogram equal to B F of the plan. Through the point *f* thus obtained draw the elevated curve line A *f* C in the usual manner. Produce the line C D until it meets the point E in the line A *d*. Produce *c d* of the triangle indefinitely in the direction of *e*. From E and at right angles to *c d* extended draw E *e*. From E as center, with E *e* as radius, describe the arc *e e*, cutting the line C D extended in the point *e*. Connect *e* and A.



Wreath-pieces which Pass from one Rake to Another of Different Inclination Over Ground Plans which are less than a Quarter Circle.—Fig. 1.—The Steps Explained in Detail.

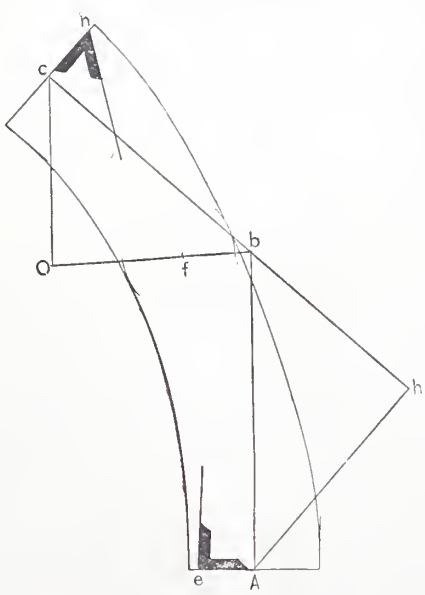


Fig. 2.—Laying Out the Pattern.

The correctness of this diagram may be proven by making the triangles A *d* D and A *b* B of separate pieces of cardboard and folding up the figure on the lines A E, E C, A H, H C and *c h*. Put the vertical triangles A *d* D and A *b* B in their places and fold the bevels up against the elevated plan. The point A in the elevation will lap over and meet A in the ground plan. The elevated curve line A *c*, with the tangents A *b* and *b c*, will take their places over the corresponding lines in the ground plan, and the bevels at *e* and *h* will be found to represent the solid angles at *c e* and *c h*.

Fig. 3 represents an abbreviated method of accomplishing the same results. From the given center line A C, with its tangents A B and B C, let it be required to draw the face pattern for a wreath-piece having its tangents over A B and B C on different rakes. Draw the triangle A *b* B, showing the rake of the tangent A *b* over A B. Draw the triangle B *c* C, showing the proposed rake of the tangent over B C. Produce C B indefinitely in the direction of *h*. From the point A draw A H at right angles with C B produced. From B, with radius B H, draw the arc H H. Consider A B as a level line, and from the hight B *b* draw *b h* on the same pitch as the tangent over B C. From H, in the line A B, draw H *h* at right angles with *b h*. On the line C B extended make H *h* equal to H *h* just drawn. Connect *h* and A. Extend the line A B indefinitely in the direction of *e*. At right angles to this line draw a line from C as shown by C E. Consider B C as a level line, and from the hight C *c* draw *c* O on the same pitch as the elevated tangent A *b*. Take C E equal to B E on the line A B *e*, and from the point E thus established draw E *o* at right angles with *c* O. On the line A B *e* make E *e* equal to E *o* and draw *c c*. Draw C *o* parallel with A B and equal in length to C O. Connect the point O thus established and B.

The manner of delineating the form of the face pattern of the wreath-piece from the two diagrams thus constructed, is very nearly the same. Referring to Fig. 2 and basing our remarks upon the full diagram, Fig. 1, proceed as follows: Draw the line *c b h* equal to the line designated by the same letters in Fig. 1. At right angles to this line from the point *h* draw *h* A equal to the level line *h* A of the diagram. Connect A and *b*. From the point *c*, draw the line *c* O parallel to A *b*, and in length equal to *c* O of Fig. 1. Connect O and *b*. Make the distance *b f* in this line equal to B F of the diagram. At A and *c* make the pattern about one-fourth wider than the rail, and at *f* only a little wider than the rail. From the points thus obtained, draw the inside and outside lines as shown. From this description it will be evident to the reader how the same figure may be described from the points obtained in the diagram, Fig. 3. The line *c b h* of Fig. 2 is equal to *c* B and *b h* of Fig. 3. At right angles with the line *c h*, *h* A is drawn equal to the level line *h* A. A and *b* are connected; *c* O, as in the former case, is drawn parallel with A *b* and equal in length to *c* O of Fig. 3. The points O and *b* are then connected. In this line *b f* is made equal to B F of Fig. 3.

These problems complete the description of wreath-pieces by the classification which we presented in our eighth paper, which appeared in the April issue last year. For the benefit of new subscribers we will briefly recapitulate the classification there presented, which will show our readers the system underlying this series of articles. We there stated that the various forms of wreath-pieces which arise in practical work may be classified, as to their properties of elevation, in three general divisions, as follows:

1. All wreath-pieces which pass from a rake to a level, or, in other words, which have raked and level tangents.

2. All wreath-pieces which have a continuous rake, or, in other words, which have their two tangents of equal length.

3. All wreath-pieces which pass from one rake to another rake of different inclination; that is, having within their length two different pitches, or having their tangents of different lengths.

We pointed out that each of these groups may be subdivided as to the form and extent of the ground plan over which the wreath extends, into six different cases, as follows:

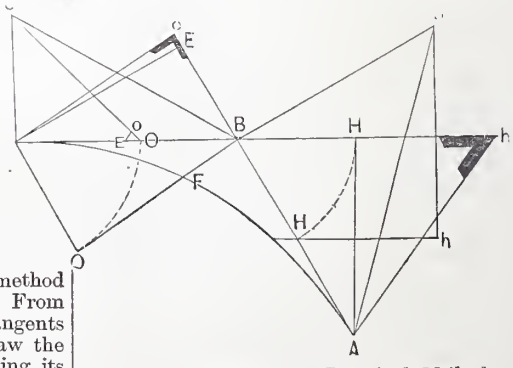


Fig. 3.—The Short or Practical Method.

1. When the ground plan is a quarter circle.

2. When the ground plan is a quarter ellipse.

3. When the ground plan is more than a quarter circle.

4. When the ground plan is more than a quarter ellipse.

5. When the ground plan is less than a quarter circle.

6. When the ground plan is more than a quarter ellipse.

We have now completed the consideration of the principles involved in these eighteen problems. They have been treated, so to speak, in the abstract, and no doubt many of our readers have regarded the presentation of the art of stair-building as rather dry reading. What remains for us from this out is the consideration of working problems which shall show in a practical manner the application of the principles to which we have given attention.

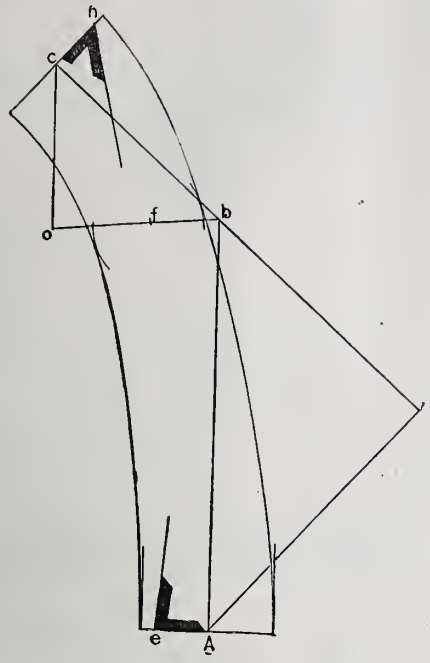


Fig. 4.—Laying out the Pattern from the Lines Obtained in Figs. 5 and 6.

Timber Construction.

Probably in the next century or at some later period, the nineteenth century will be looked upon as the age of the copyist in all matters pertaining to art decoration, and to a great extent in building also. Just now, both in England and America, timber constructions for domestic architecture are in great favor. Some of the English papers call this a revival of timber architecture, and it is openly stated that many of the recent English designs in that line are literal copies of work that has been done elsewhere. The fashion for timber houses, which is growing in England, and the study of Norwegian timber work by British architects, have given great impetus to building of this kind. In this country we have of late years frequently seen timber buildings, but would protest against them in this climate in the most emphatic manner. We have many examples of both good and bad in design, and however much we may be pleased with their artistic appearance, we cannot blind ourselves to the fact that timber construction is unsuitable for our climate. The extreme heat of summer, our driving rains, and the snows of winter, all tend to make its life exceedingly short. It is practically impossible to expose timber to the weather without causing it to crack. Once cracked, dirt and wet find lodgment, decay is set up, and the destruction of the work is comparatively rapid. If we must build of wood we must sheath in wood. The clapboard is by far the best form for sheathing. At least if the clapboards are cut as they should be, radially, they will not shrink so as to leave leaking joints, nor will they warp or curl in any way. How long such clapboards will last when sawn from good pine sticks, we do not know. We have seen them on houses 40 years old and they seemed to be sound and tight, and though considerably weathered, good for many years longer. The thin clapboard of the present time would be badly wasted away before its integrity would be injured from any other cause. No amount of painting or putty this timber work is likely to get, is sufficient to keep it in good condition, without a covering that shall completely isolate it from the weather. Its own shrinkage will open joints in such a way that paint and putty cannot give protection.

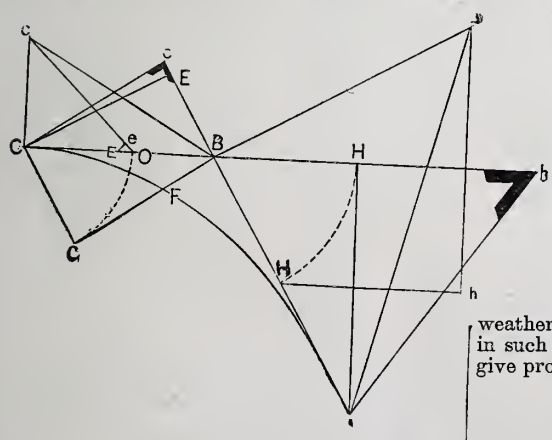
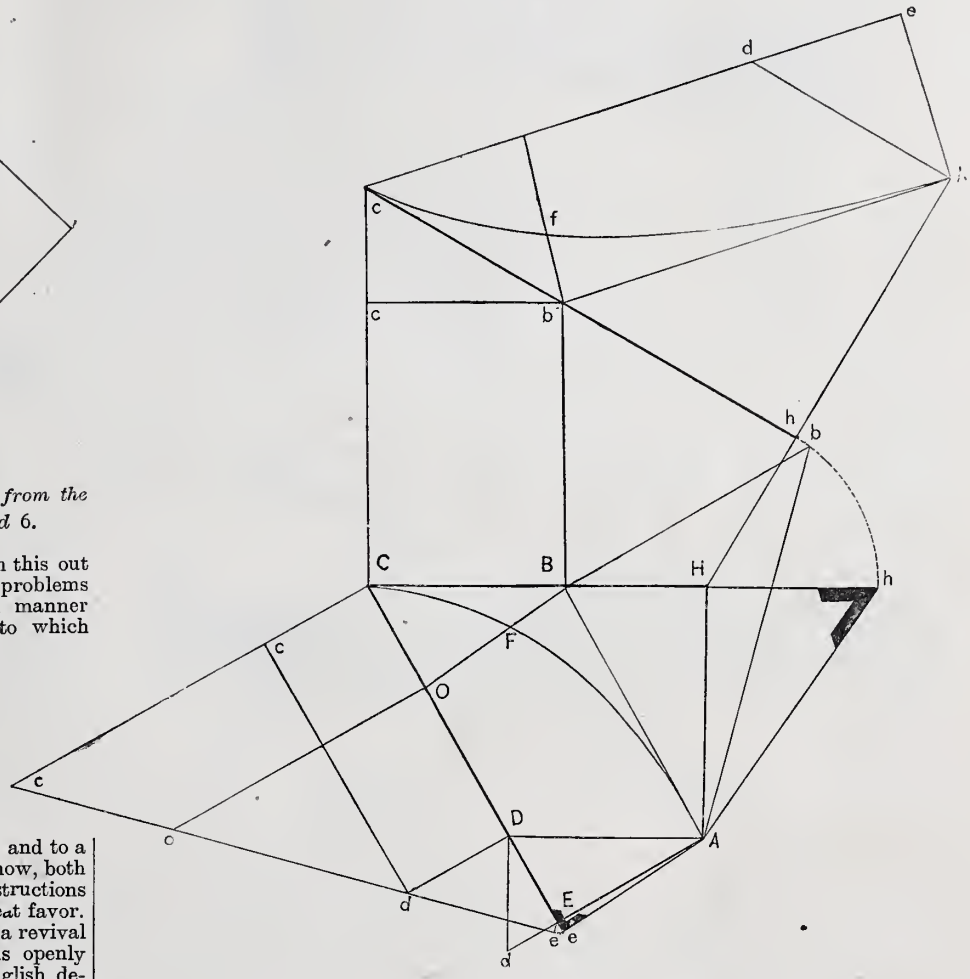


Fig. 5.—The Short or Practical Method of Reaching the Results shown in Detail in Fig. 6.



Wreath pieces which Pass from one Rake to Another of Different Inclination Over Ground Plans which are Less than Quarter Ellipses.—Fig. 6.—The Several Steps shown in Full.

STRAY CHIPS.

OUR BOSTON EXCHANGES contain accounts of the finest and costliest private residence yet erected in that city. The owner is Gen. C. A. Whittier, and the architects are Messrs. McKim, Mead & White, of New York. Prof. T. M. Clark, of the Massachusetts Institute of Technology, is the supervising architect in charge. The location of the building in question is No. 272 Beacon street. The house, which it is expected will be ready for occupancy the coming fall, is seven stories in hight and contains upward of fifty rooms. The exterior is massive and at the same time elaborately carved, and is believed to be the handsomest façade in the city. Seven rooms are contained in the basement, a servant's hall, laundry, drying-room and kitchen. The first floor above contains a library, dinning-room, reception room, and large main hall. These rooms will be finished respectively in imported red wood, oak, pine and quartered oak. The second story will contain fourteen rooms exclusive of the hall, and will be finished in a variety of costly woods elegantly carved. The third floor contains the same number of rooms as the one below and will also be finished in an elaborate manner. The fourth floor contains a music room 40 x 24 feet. It will have a paneled ceiling, hardwood walls, and will be so constructed that private theatricals can be given. Eleven other rooms are located on this floor. The fifth and sixth floors will be devoted exclusively to rooms for servants. A hydraulic passenger elevator will run from the basement to the extreme top of the house. The house, when finished, will certainly attract the attention of every one who has occasion to pass in that vicinity, and, as we have already said, will be the largest and costliest private dwelling in Boston.

A FULL REPORT of the work performed by the Building Bureau of this city during last year was submitted by Inspector Esterbrook to the Fire Commissioners on the first of February. During the year there were submitted to the Bureau, and acted upon, 2682 plans, and the total estimated cost of the buildings was $43,391,300. Of the plans presented 110 were rejected on the ground that the buildings would be unsafe. The report of alterations in buildings shows that 1497 plans were presented, and that the entire cost of the proposed changes was $4,142,-070. From this our readers will readily esti-

mate that the building business in New York City alone during last year approximated $47,500,000. From present indications the current year is likely to be another season of activity in building affairs.

THE BUILDING BUSINESS in Cincinnati has, during the last month, seemed to become quiet, as though money was becoming a little close. Still, several new buildings are projected, but not as many as was expected earlier in the winter. Mr. James McLaughlin has on the boards an elegant residence for Mr. Truman B. Handy. This will be built in Clifton, and will be one of the largest and finest of the many costly residences in that beautiful suburb. It will be built en-

Fig. 19.—General View of a Wall Knot.

tirely of Ohio freestone, and will have a frontage of about 117 feet. The principal feature of the front is a very beautiful and finely-proportioned octagonal tower and imposing central entrance. Mr. Isaac Graveson is the contractor for the stonework of the entire building.

THE PLANS for the new Olympic Theater at St. Louis are finished, and bids are being invited for doing the work. The demolition of the old buildings adjacent to the present Olympic has already begun. The new theater will have a greatly increased frontage on Fifth street and will be much enlarged in other directions.

THE EMERY BROS. are contemplating the erection of a theater on the site of Hunt's

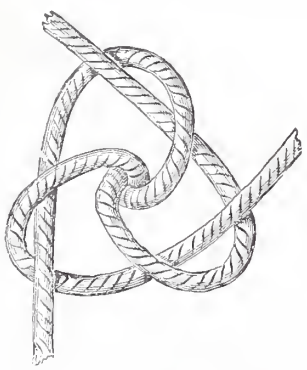


Fig. 20.—End View of a Wall Knot Commenced.

Hotel, on Vine street, Cincinnati. It will be one of the finest places of amusement in the West. The auditorium will be on the level of Vine street, and will be about 90 x 125 feet, including stage. The street front will be eight stories in hight, and will be used for stores and offices. The stores, &c., will extend back for about 65 feet. The entrances to auditorium, balcony and gallery of theater will all be kept separate and entirely distinct. Mr. S. Hannaford will probably be the architect in charge.

SOME OF THE leading members of the Mechanics' and Traders' Exchange in this city, are talking about appointing a committee to seek from the Legislature a bill which shall regulate the hight of buildings. They would restrict their elevation on narrow streets to 100 feet, and in no case allow them to exceed 175, which is about the hight of some of those most recently erected. They also argue in favor of iron window casings and by other methods to render them fire-proof. Mr. Field's new building near the battery, it is said, will be 200 feet high, exclusive of the dome.

MR. E. ANDERSON, of Cincinnati, has a large and fine store building now well ad-

Fig. 21.—Side View of a Wall Knot after the Strands have been Drawn Tight.

vanced toward completion. It will be six stories in hight, with a frontage of about 30 feet. It is to be occupied by a hardware firm, and the timbers, &c., are heavy on that account. The front is of solid Ohio freestone, the details, &c., being in the Norman style of architecture, very effectively treated.

Management and Use of Ropes.—II.

When it is desired to have a rope terminate in a square-shouldered and durable knot, the end is furnished with what is called by sailors a "wall knot." Why this name was given to it we do not know. It is

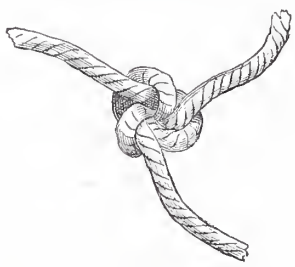


Fig. 22.—Top View of a Wall Knot after the Strands have been Drawn Tight.

of two kinds, one against the "lay" of the rope, and the other with the lay. In books on nautical affairs we can get very little information in regard to the value or the uses of different kinds of knots, chiefly because we suppose the writers considered the matter too simple for any sailor to trouble himself about. To make a wall knot the rope is untwisted or "unlaid," as shown in Fig. 12. The strands must be opened to some length, however, in order that they may be long enough to form the knot and have something to spare. If the knot is to be made double or "crowned" the strands should be unlaid for a distance of about five or six times the diameter of the rope. In Fig. 19 strand 1 is bent around and held with the fingers so as to leave a bend. The end of 2 may be then

Fig. 23.—Top View of a Wall Knot Crowned by Interlacing the Ends before Jamming Down.

put through this bend, leaving another. End 3 is then taken over and then under the end of 1, as shown, and its end passed through If the rope is large and unmanageable, the novice may pass a few turns of twine around the rope. His whole attention can then be devoted to the formation of the knot. When once the theory of the formation of the knot is obtained, there is no whipping or "serving," as the whole knot can be completed with one hand while the other holds the rope fast.

Figs. 21 and 22 show a top view and side view of wall knot after the strands have been drawn tight and jammed fast. We advise the reader to pay more attention to the top

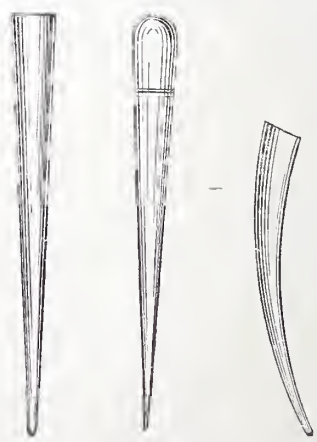
Fig. 24.—Top and Side View of a Wall Knot Crowned by Interlacing the Ends after Completion.

views than any others, as they give the best idea of the methods by which the strands are to be interlaced. The side views are valuable as showing the finished appearance of a knot. A wall knot, if tightly jammed so that it will not slip, may be left at this stage. It is then called a single wall knot; it is safer, however, to crown it by interlacing the ends of the strands, as shown in Fig. 23. Fig. 24 shows top and side views of the knot com-

Fig. 25.—Marlinspike.

pleted. The different strands are shaded, so that each may be traced through all its interlacings. The same knot may be made by making the interlacings twist and go against the "lay" of the rope. Directions are given for this in some nautical works. It is sufficient for ordinary purposes to form the knot as we have shown.

The next subject to which we shall give attention is the splicing of ropes. To a



Figs. 26, 27, 28.—Different forms of Fids.

sailor a broken rope is only an inconvenience in itself, and its repair costs only a little time and the loss of few feet in the length of the rope. Its strength has not suffered any diminution, if strength has been important, nor has there been any enlargement of the rope to hinder it from passing easily through blocks or pulleys. To the landsman, however, the breakage of a rope

generally means an end to its usefulness in its original work, and the purchase of a new one, unless, indeed, a sailor is within reach to make a splice. We propose, however, to give such plain directions in regard to the proper methods of splicing that any mechanic

Fig. 29.—First Step Toward Interlacing or Weaving the Strand.

who will carefully follow them will be able to splice a rope in such a workmanlike manner as to lose but little of the original strength, and by practice to make a splice which shall have its full theoretical strength.

The tools needed are few in number and simple to make. First and almost indispensable is a "marlinspike" or its wooden coun-

Fig. 30.—The Strand after the Marlinspike has been Withdrawn.

terpart a "fid." These are shown in Figs. 25 26, 27 and 28. The marlinspike is of iron, 8 or 10 inches long and perhaps an inch or an inch and a quarter in diameter at the largest end and tapering to a point at the other. The fid may be of any size, and is of hard, tough wood. For small soft ropes a fid may be whittled in a minute out of any piece of wood that comes to hand. For finishing elaborate knots or working hard ropes a marlinspike, or a fid made from a hard, tough piece of wood, is preferable. A knife and plenty of grease, together with some small but strong twine, complete the necessities for splicing, excepting the rope to be spliced, which, of course, is supposed to be already at hand.

First we will take up the short splice, which,

Fig. 31.—A Strand Interwoven with the Strands of a Rope.

when properly made, will give a strength, it is said, of seven-eighths that of the rope itself. It is quickly made, convenient and may be used for joining ropes together. When one can make it properly little trouble will be found in learning a variety of other splices, &c.

When one rope is to be joined to another after the fashion of a short splice, the strands are interwoven with each other in a regular way, something after the fashion of basket-work. This interweaving holds by means of

Fig. 32.—A Strand Tapered before being Stuck.

tho friction of the strands upon each other. To make the matter plain we will begin with a single strand of a rope which we will suppose is to be worked into a rope as though a splice was to be made. Fig. 29 shows the first step toward interlacing or weaving the strand. It represents the position of the marlinspike after it has been thrust through under a strand to make way for the strand which is to be inserted. Fig. 30 represents the strand after the marlinspike has been withdrawn. Through this opening the strand is passed. Another strand of the rope is raised in the same manner, and the strand is "stuck" through again. This is repeated the proper number of times to finish the splice. Fig. 31 represents the strand interwoven with the strands of a rope. In other words, it has been "stuck" through until the end is hidden in the center of the rope. It must be observed that in "sticking" this strand it is carried over and then under. To make it disappear toward the end, and give the splice a neat, finished appearance, it is necessary to taper it. After the strand has been "stuck" once or twice, it is opened, and a half or quarter or other proportion of the yarns of which it is composed are cut off with a slanting cut. These yarns are twisted in so their ends do not show. The next time the strand is stuck more yarns are cut off, and in this way the strand becomes so small that it can be entirely covered by the last strand under which it is stuck. Sometimes a certain proportion of yarns are cut out when the strand is stuck the first time. In small ropes, or those where the size of the splice is not material, the full strand may be stuck twice or three times and not tapered. This is done for the sake of strength. Fig. 32 shows a strand as it would appear if it were tapered before being stuck at all. As the strands cannot be stuck squarely in the line of the rope, there is a tendency for them to twist or travel around against the lay of the rope.

So far we have only given the method of treating individual strands. Fig. 33 illustrates the principle of interweaving a three-stranded rope. It is a diagram showing how the strands interlace. In order that all these strands may be seen side by side, the figure is drawn to show a very large rope made up of a considerable number of strands. When tho upper strand goes over, tho next goes under, thus making a sort of diagonal basket-work.

To make a splice, the ends to be spliced should be "unlaid" some little distance, if the operator is a beginner, say on an inch rope 5 or 6 inches. Then a whipping had best be put around each rope to prevent the strands from opening further. Next bring the two ropes together in the position shown in Fig. 34. Strand 1 is now to be "stuck"

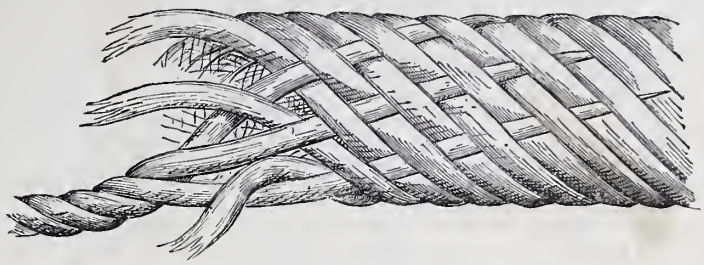


Fig. 33.—The Principle of Interweaving a Three-Strand Rope.

under the strand A, as near the whipping as possible. Strand 2 is stuck under B. Strand 3 must go under strand C, but on the other side of the rope. Now taking the other strands, 4 is stuck under E, strand 5 is stuck under D and strand 6 is stuck on the other side of the rope under the strand F. Care should be taken to twist the strands up hard and to use plenty of grease on them to make them pliable and secure. After the strands have stuck "whole" once, as directed, a

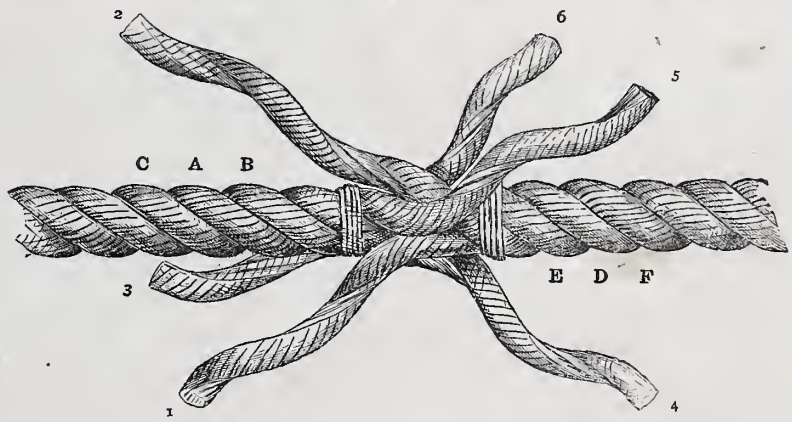


Fig. 34.—Bringing Two Ropes Together in Splicing.

portion of the yarns of each strand may be cut out before sticking the strands through again. The number that are cut out and the number of times that the strands are stuck depends upon the character of the splice desired. If it is wanted to be small and neat and to taper out into the rope each way neatly, the strands are tapered quickly and carefully and the ends hidden in the heart of the rope. If strength is wanted and the size of the joint is of little importance, the strands

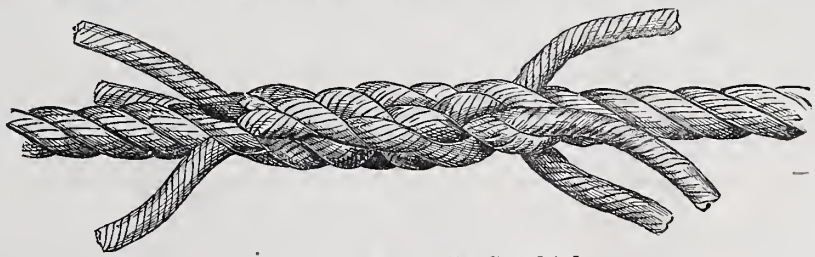


Fig. 35.—A Short Splice Completed.

are sometimes left nearly or quite the full size, and after they have been stuck three times these ends are "served" or whipped and allowed to project, instead of being cut off close. In sticking the strands the regular alternation of under and over must be followed. In large ropes this splice is somewhat bulky, and, as we have said, is not considered as strong as the rope itself. Fig. 35 shows a short splice completed. It was made in small rope and all the strands are full size to the ends. This figure shows the increase of the size due to the splice, which, however, has not been hammered.

Decision in the Fifth Competition.

The interest manifested in the fifth competition advertised by *Carpentry and Building* has been greater, probably, than that called out by any similar effort ever put forth by a mechanical journal. The voting has been spirited, and those to whom the prizes are awarded in this decision have reason to feel proud of the results achieved. While saying this, however, we cast no reflection upon those who were unsuccessful, for, as will be seen by the figures below, the contest was so close that those who were defeated have almost as much honor as those who were successful. The limited time that our readers were allowed for forming their opinion and forwarding their ballots, has undoubtedly made the aggregate vote much less than would have been the case had the conditions been more favorable. Further than this, each one was required to mutilate his paper in order to indicate his choice in this matter. This condition alone, as we have discovered by correspondence, prevented a very large number of our subscribers from voting. With all this, however, the number of votes cast was beyond our most sanguine expectations.

The result of the vote is to award the prizes as follows:

FIRST PRIZE, $50.

To Mr. Henry S. Jaffrey, of Chicago, author of the set of plans marked No. 3 in our last issue.

SECOND PRIZE, $30.

To Mr. Robert A. Watson, of Boston, who submitted the set of plans marked No. 91.

THIRD PRIZE, $20.

To Mr. Henry L. Campbell, of Philadelphia, the author of the plans marked No. 69, published in the February number.

The following is a complete list of the ten competitors, with the numbers by which their plans were indicated in our last issue, with their several addresses:

No. 3. Henry S. Jaffrey, 95 Washington street, Chicago, Ill.

No. 91. Robert A. Watson, 47 Bickford street, Boston, Mass.

No. 69. Henry L. Campbell, 427 Walnut street, Philadelphia, Pa.

No. 6. W. L. Morrison, Rochester, N. Y.

No. 29. B. C. Pond, Auburndale, Mass.

No. 58. Franklin J. Sawtelle, 5 Custom House street, Providence, R. I.

No. 97. Theo. A. Richter, Jr., cor. Fifth and Walnut streets, Cincinnati, Ohio.

No. 138. A. E. Bodwell, Concord, N. H.

No. 191. Von Beck Canfield, 54 Division avenue, Brooklyn, E. D., N. Y.

No. 208. Alexander Millar, 305 East John street, Baltimore, Md.

Of the entire vote cast, No. 3, the design receiving the first prize, received a trifle over 19 per cent. No. 91, receiving the second prize, followed it with almost 16 per cent., while No. 69, receiving the third prize, had a trifle over 14 per cent. of the entire vote cast. The next in order of popularity was No. 138, receiving almost 12 per cent. Following this was No. 6, receiving a little over 9 per cent.; No. 29 had 8½ per cent., and No. 97 had 7½ per cent. The next in order was No. 58 with 5½ per cent., while No. 191 and No. 208 each received a little over 4 per cent. of the entire vote.

A survey of the tally sheet that was made up from the ballots shows that the most spirited voting came from three well-defined geographical sections of the country, namely, the Eastern States, the Middle States and the Central Western States. Maine, New Hampshire, Vermont, Massachusetts, Rhode Island and Connecticut together cast 20½ per cent. of the total vote; New York, New Jersey and Pennsylvania 28½ per cent., while the Central Western States, commencing with Ohio on the east and extending to Iowa and Missouri on the west, cast a little over 35 per cent. of the entire vote. The remaining 15 per cent. was divided over the Southern States, the extreme Western States and Canada. The shortness of the time prevented returns from most of our subscribers on the Pacific coast. The four States casting the largest votes, with the percentage of each, are as follows: Massachusetts, 10 per cent. of the entire vote; New York, 15 per cent.; Penusylvania, 11 per cent., and Ohio almost 11 per cent.

Referring to the prize designs, Massachusetts showed her preference for No. 91, the second prize, by casting the largest vote for it. No. 69, the third prize, was only three votes behind it, however, while No. 3, receiving the first prize, ran behind the ticket, as politicians would say, receiving considerably less than one-half as many votes as the second received. In New York the conditions were somewhat different, No. 3 and No. 91 each receiving the same number of votes, while No. 69 fell one-third short of the number cast for each of the other two. In this State No. 6 was the third choice of those who voted. Penusylvania gave a characteristic majority for No. 3. Her second choice was No. 69, and her third choice No. 29; No. 29, however, received only two votes more than No. 91. The first choice of Ohio was No. 3. The second choice of this State was No. 69, and the third choice No. 91. Nos. 97 and 138 also ran well in this section of the country, the first falling but two votes behind No. 91, and the second but four votes.

A number of coincidences are shown upon the tally sheet. New York and Ohio each cast the same number of votes for No. 3, and were also a tie on No. 69. Pennsylvania cast the same number of votes for Nos. 208, 191, 97 and 58. The highest number of votes cast by any one State for either set of plans was given by Pennsylvania for No. 3, and the majority thus cast really determined the contest as between No. 3 and No. 91 for the first prize. Pennsylvania seems to have been almost as important in this matter as in political affairs.

A considerable number of ballots reached us too late for the count, and while they had no effect in determining the result, we were pleased to receive them as evidences of the good-will and friendly interest of the senders. Several wrote to have their votes changed after they had been sent in. Of course, we could pay no attention to such requests. There was no going behind the returns. A number sent ballots in the form of postal cards and written out in letters instead of using the printed form. All such were rejected on account of informality. The conditions of the voting, as laid down in the February issue, were strictly adhered to.

As mentioned in our last number, upward of 200 sets of plans were received in this contest. Over 100 of these possessed features of marked excellence, the publication of which would be a credit to their authors and a desirable feature in our paper. Of course, it is impossible to lay the entire assortment before our readers. We have, however, determined to publish a number besides those that have already appeared, in the way of friendly criticism and comment. Two or three of the best sets of plans submitted were thrown out by one or the other of the three committees through whose hands they passed, on account of discrepancies or because the building could not be constructed without material alterations in the plans. Several of the authors of plans have invited criticism in a way to which we feel bound to respond, and therefore we design publishing some of the less meritorious plans in order to serve the interests of beginners in the architectural profession. Since the decision with reference to the best ten was made the plans have been carefully examined by competent persons, and a list of names for honorable mention has been partially prepared and will be published in our next issue.

This may be an opportune time to call our readers' attention to the well-established rule in business correspondence of keeping matters belonging to different departments of a business separate and distinct from each other. This prevents delays and saves many annoyances which otherwise are almost inevitable. To show what trouble may be caused by the failure to observe this very reasonable rule in its true spirit, we will mention an incident which occurred in connection with this competition. We received complaints that certain parties were not receiving their papers, for which remittance was declared to have been made. A search through the office failed to throw any light upon the matter. Finally, when we came to open up the envelopes containing the *noms de plume*, after finishing the tally of the votes, we found the missing remittance. Our correspondent had put it inside of the envelope, which, by the very terms of the competition, he knew would remain unopened until a decision was reached. It would have been much more business-like to have put his subscription into another envelope and sent it independent of the set of plans he submitted. We mention one case only. The same circumstance has occurred a number of times in this office. Hence the prominence we give it at this time.

As has already been announced, our next competition will be the elevations, attic plan, roof plan and exterior and interior details of a house built to the plans receiving the first prize; in other words, built to the plans marked No. 3 in our February issue. In our April number we shall republish these plans, engraved to the scale of ⅛ inch to the foot, and at that time will make known all necessary particulars concerning this contest. The general conditions will be found described in the advertising pages of this issue.

IN NO OTHER BUILDING in the world, perhaps, has there been so much written and published upon the subjects of fire-proof construction, fire protection, fire-escapes, and kindred topics, as in the Potter Building, recently destroyed. In it were the publication offices of several widely-known newspapers, two of which, at least, gave special attention to the topics named, and frequently illustrated improvements in apparatus for suppressing fires, rescuing people from burning buildings, rendering buildings safe from the spread of fire, &c. It is a startling commentary upon the apathy of the public in matters affecting life and death that the very building in which so many useful ideas on these subjects have first been made public, should have been of a character to be wiped out of existence almost instantly and during the hours of active business. Some of the very men who have been most instrumental in disseminating information upon these topics barely escaped with their lives. The building was situated in the very focus of the busiest center on the continent, and upon one of the most valuable sites in the city, yet it was a tinder-box in character, wholly unprovided with precautions against fire or fire-escapes.

THE YOUNG MECHANIC who thinks it a harder task to take front rank in his trade at the present day than it was for his father to achieve excellence in the same pursuit in his time, should be reminded of the many advantages he enjoys of which his father knew nothing. Even so short a time since as a generation ago, in this country, at least, there were no technical schools; text-books on mechanical subjects were very few; there were no mechanical papers published; a mechanical dictionary was an unheard-of thing; large factories did not maintain circulating libraries for the benefit of their mechanics, and popular lectures on mechanical topics were not conspicuous features of each winter in all the larger cities. Free night-schools for instruction in drawing had not been thought of, and many other advantages which the young mechanic of to-day enjoys were then unknown. But a thing which the mechanics of forty or fifty years ago possessed, which in many cases is sadly lacking in the youth of the present day, was self-reliance. Our boys have so many helps, and things are so generally prepared for them, both in the public schools and in other departments of our educational system, that they learn the habit of abject dependence, and fail to acquire the habit of asserting themselves and investigating upon their own account. To this difference is to be ascribed, in many cases, the failure of our young mechanics to profit by the unusual opportunities which are opened around them.

THE PHŒNIX PLANING MILL, St. Louis, Mo., which was burned last fall, has been rebuilt and enlarged, and will be ready for business early in the spring. The new mill is 125 feet front by 140 feet deep, two stories high. It will give employment to about one hundred and fifty men.

CORRESPONDENCE.

Floor Truss.

From G. P. RANDALL, *Chicago.*—I inclose herewith a design of a floor truss which I have had executed recently in a town hall at Marmette, Wis. Some of your correspondents last year were inquiring as to the proper methods of calculating the strains on such a truss, and these will be found herewith also. For the reason that the algebraic formulæ are not always understood by builders, I shall endeavor to give the directions for these computations in language that they may understand, though in doing so I shall have to take more space in your valuable paper. It is of little use to state these formulæ in a language that would only be understood by mathematicians, for this class need no suggestions from me.

This drawing of the truss referred to consists of a side view or elevation, Fig. 1, and a top view, Fig. 2, which shows the top of the chords, and these consist of two sticks, 7 by 12 inches each, with blocks separating them 2 inches, and these are bolted through and

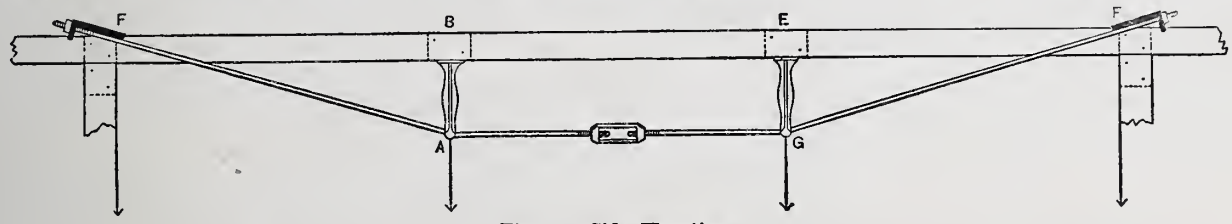


Fig. 1.—*Side Elevation.*

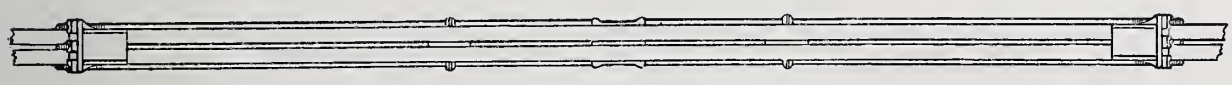


Fig. 2.—*Top View.*

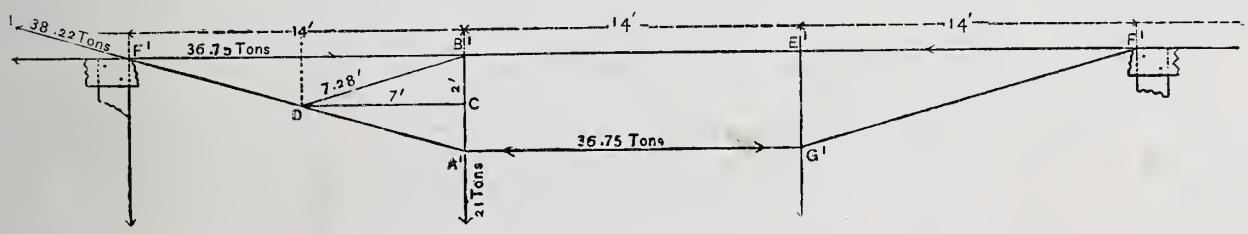


Fig. 3.—*Diagram showing Lines of Force.*

FLOOR TRUSS.

together with ⅝-inch bolts. This beam has a 1¾-inch rod between the two sticks and one on each side, the ends being passed through an iron shoe, which is let into the beam at each end and bolted down to it. This beam rests upon two posts 42 feet apart. The floor and beam are continued beyond the posts, but this is not taken into the account in computing the strength of the beam. This beam lies in a longitudinal position in the middle of the width of the building, which width is 40 feet, hence the floor area, supported in part on and by this beam, is 40 by 42 feet, or equal to 1680 square feet. We will suppose this floor to be covered with people as thickly as they can stand, and this manner of packing has been found to be equivalent to 120 pounds to the square foot, to which we will add 30 pounds for the weight of floor, and we shall have an even 150 pounds to a foot, or, for the whole floor, 252,000 pounds. One-half of this would be supported by the side walls of the building, so that the beam would only have to sustain 126,000 pounds, and as this beam is itself supported at each end, and the load divided between the ends and points of support at B and E, it follows that the truss, of which the beam forms a part, only carries two-thirds of this 126,000 pounds, or 42 tons. This gives a downward pressure at B and E of 21 tons each, the other 21 tons being divided equally between the points F and F—10½ tons each—but these weights are not any part of the load supported by the truss. The part resting on and supported by the truss, is all of the middle section from B to E (see Fig. 3), and half of each outside section, B F and E F. The lines of Fig 3 are intended only to show the lines of force in the truss, Fig. 1, and hence in the explanation that follows we shall refer chiefly to the lines in this figure.

Having now explained and pointed out the forces acting on this truss and how they are concentrated, we will now proceed to measure the strains on these rods, and having determined them, to provide the necessary resistance to these strains.

Referring to our diagram, Fig. 3, we will draw the line B D in a reverse inclination to F A and it will cut F A at D. Draw D C parallel to the chord F B and it will cut B A at C, and B D A is the triangle of forces in this figure. The line B A represents the downward pressure, the line D C the horizontal pull on that part of the truss rod from A to C, or the push on all parts of the beam F B E F, and B D or D A the pull on the inclined part of the truss rod F A or F G.

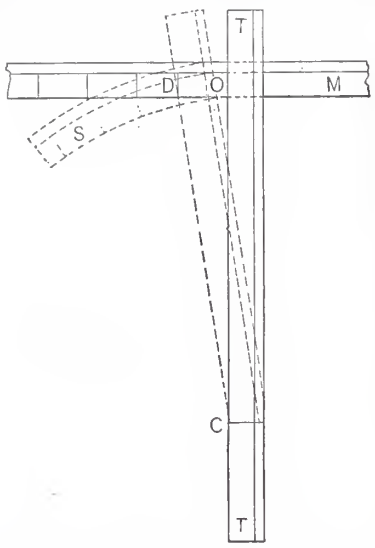
Now we have this triangle of forces of which the line B A is, by measurement, 4 feet, and the downward pressure which it represents is 21 tons. From this point we will proceed with our measurements of its strength, both mechanically and mathematically, but mechanically first; and to do this without the aid of figures we will divide this line into 21 equal parts and call each of these parts equal to a ton of force, and with this scale measure the length of the lines D C, and it will be found to represent 36.75 tons, or the strain of push or compression on the beam, and also the pull on that part of the tie-rod represented by the line A C. By the same scale measure the lines D B or D A, and either of them, will represent 38.22 tons, the pull or tensile strain on the line F A or the part of the rod represented by this line. If the drawing be large and accurately made, and the divisions representing tons be subdivided to represent fractions of a ton, as, for instance, a hundred pounds, these mechanical computations will be found to be exceedingly close and sufficiently accurate for all practical purposes.

In making this scale of measurements it is not necessary that we take just the length of the line B A. It may be more or less than this line, but whatever part it be, it must be divided into the number of tons or units of weight that is concentrated at this point, and the other sides of the triangle of forces must be measured for their exertion of force by this scale. In other words, it matters nothing as regards the dimensions of this triangle of forces so long as it retains the form and proportions indicated, but in working it out mathematically, as we are now about to do, we shall save the trouble of getting the D C leg of the triangle C D B by taking the whole hight of this side of our triangle of force, because the half of it, C B, gives us a triangle of which D C is just half of the given line F B, or in this case 7 feet. With C B representing 2 feet and C D 7 feet, we can get the length D B. To do this we square the two short sides of the triangle, and the square root of their sum is equal the hypothenuse or longest side, or in this case 7.28 feet. Now we have the measures of the three sides of a right-angle triangle, together with the measure in tons of the double of one of their sides, and the rule of proportion will complete the balance of our computation, Thus, as 4 feet (the length of the line B A) is to 21 tons, so is 7 feet to the measure in tons of the line D B, or 36.75 tons; and again, as 4 feet is to 21 tons, so is 7.28 feet the length of the line D B to its measure of force, or 38.22 tons.

By mathematical, then, as well as by mechanical measurements, we find that in the inclined part of these truss rods we have a tensile force, or force of pull, as it is sometimes called, in the three rods of 180 tons, and a resisting force of 38.22 tons, or a factor of safety of 4.7, which is rather small, but it, in fact, greatly exceeds this, and for the reason that the weight on the floor can never attain to 150 pounds to a square foot. A factor of safety of from 5 to 6 I regard as sufficient for such trusses. I have built a great many of them, and never had one fail; but for the benefit of builders who have never had much experience in building them, I would suggest that no pains be spared in fitting the iron shoe at the ends of the rods to the beam, and so that the bed for the nuts shall be at right angles to the pitch of the rod—that is to say, of its inclination to the line of the beam. Generally I have omitted this shoe, and allowed the washer under the nut to take its bearing directly against the end of the cut at right angles to the pitch of the rod. If these are badly fitted so as to cramp the nut and rod when the nut comes to its bearing, it will tend to snap the rod directly under the nut, and in such case all computations avail nothing. To obviate this difficulty, I have sometimes taken heavy or thick pieces of sole leather as large as the washer or bearing-plate, if a shoe is used, and having soaked it till comparatively soft and pliable, put one of these between the nut and its bed, or between the washer and timber; then turn the nut down to its bearing, and the softened, elastic leather will give a little under the pressure, and when dried it will become hard again, and make a solid and firm bearing for the strains. Where rods are strained to so high a tension by strains in this direction, too much care cannot be bestowed on the adjustments of these bearings, even to the minutest details.

Kerfing.

From W. P., *West Milton, Ohio.*—In the September number of *Carpentry and Building*, J. H. H., Mount Clair, W. Va., asks for a method of bending moldings by kerfing. I inclose a diagram illustrating a way which may be new to some of your readers. C represents the center of the circle about which the molding is to be bent. The dotted lines S represent the segment. M is the straight molding; T represents a trial piece of the same size as the stuff to be bent. The gauge line on the trial piece and a similar line on the molding show the depth to which the kerf is to be cut. A kerf is cut in the trial piece at C to the gauge line. The piece is then held in position at one end, while the other end is sprung until the kerf closes at C. The distance traversed by the long end of the trial piece is shown by the dotted lines O D. The space represents the distance apart the kerfs are to be cut, and may be spaced as shown on the molding by using a pair of compasses. In cutting the kerfs it is



Kerfing.—Fig —1.—*Sketch from W. P.*

well to have a fence on the saw, in order to regulate the depth of cut accurately and to save time.

Similar answers to this question were also received from H. E. D., Roseland, Ill.; T. T. B., Guelph, Ont.; H. T., Sharon, Mass.; F. A. R., Kendaria, N. Y.; F. M. H., Worthburg, Tenn.; J. E. S., Ridgefield, Conn.; W. J. S., Lake Linden, Mich.; F. H. S., Bristol, Conn., and A. A., Wells River, Vt.

From B. W., *Lowell, Mass.*—Suppose a circle on the outside where the molding is to be placed is 2 inches larger than the inside. Just take out as many saw cuts from the inside as will consume the 2 inches. Then the molding being placed, the cuts will come to a joint.

From L. P. G., *Bellwood, Canada.*—My plan for bending moldings around curved surfaces may be explained by the following illustrations: Suppose it is desired to bend a piece 1 inch thick around the outside of a half-circle, 26 inches in diameter. When the piece is bent the inside diameter with these conditions would be 24 inches. Now, to get the difference in the length of the circumference of the inside and outside of the piece when bent, multiply the diameters by 1.5707. Thus 26 inches × 1.5707 = 40.83, length outside, and 24 inches × 1.5707 = 37.69 length of inside. The difference is 3.13 or 3⅛ inches. This space must be cut out in order to make the bend. If the saw cuts 1-16th inch at each cut, it will require fifty saw-cuts equally spaced in the 40.83 inches to make the required bend.

From L. A. M., *Taunton, Mass.*—Take any piece of wood that can be kerfed to bend around a circle and lay it flat on the bench. Measure back the radius of the circle from one end. Saw with any saw until that joint can be shut. Hold that on the bench firmly. Raise up the given end. Set the compasses from the under side of the end of stock to the bench. Then space off enough to go around the circle and saw with the same saw.

From F. A. D., *Montreal.*—Referring to Fig. 2, suppose A B C to be the curve to which the board is to be bent. Take a strip as wide as the board is thick and a few inches longer than the radius of the circle. Run a kerf in with the saw which is to be used. Tack a strip on, as shown, so that the kerf will come at D. Then bend it in the direction of the dotted lines. Then the distance from C to E will be the distance between the required kerfs.

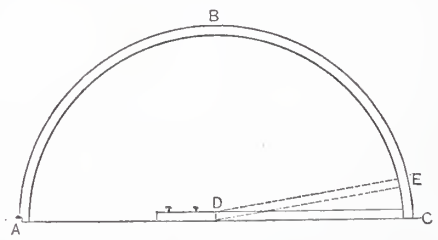
Similar answers to this question were received from J. E., Lawrence, Ky.; J. R. L., Lowell, Mass.; I. C. L., Germantown, Pa.; W. T. J., Silver City, N. M., and T. S. McVay of Philadelphia.

From E. E., *Rantoul, Ill.*—If your correspondent will saw one kerf in or near the center of his piece to be bent, then place it on the form, and bend both ends down, as indicated by the dotted lines on the accompanying diagram (Fig. 3) until the saw kerf at A comes together, the distance 1 2 on the line B C will be the proper space for the kerfs on the piece to be bent.

From J. R. McK., *Newbury Center, Vt.*—A correspondent some time last year inquired with regard to cutting moldings, baseboards and other finish for elliptical curves. I will give him and other readers of *Carpentry and Building* who may be interested, my method of doing such work. I proceed upon the plan that an ellipse may be resolved into segments of circles, and then treat each segment independently upon the same plan that is usually employed for bending moldings by kerfing. I think this hint will be sufficient, and will enable all who have this kind of work to perform, to accomplish it intelligently and satisfactorily.

Criticisms on a Cheap Frame House.

From F. W. S., *Green Castle, Ind.*—I would like to ask your correspondent, Elias Ayars, for an itemized estimate of the carpenter work on the house illustrated on page 236 of the December number of *Carpentry and Building*. I would like to have him give the quantities and prices of each item. The idea of a six-room house, with a sink in the kitchen, and cistern and other modern im-



Kerfing.—Fig. 2.—Sketch Accompanying Letter from F. A. D.

provements, being built for $72 is a most astonishing one. I cannot see how it can be done. A rough calculation of the work necessary to complete the house gives the following:

1000 feet of flooring.	8 single windows.
1175 feet of roof.	2 outside doors.
1880 feet of outside wall.	11 inside doors.
900 feet of inside wall.	22 sets of casings.
130 feet lineal of cornice.	1 porch.
200 feet lineal of base.	1 kitchen sink.
65 feet lineal of wainscoting.	1 stairway.
2 mullion windows.	1 wooden cistern.
	4 closets.

These figures are only approximate, but will serve to indicate the amount of labor required on the job. Now, it may be that mechanics in this vicinity are in great haste to get rich, or that we do not know how to manage work properly, but according to the scale of prices in use in this place, the work could not be done for less than $175. For my part, I should hesitate before contracting for it at that figure, hence I take the liberty of asking for the estimate, as the difference is sufficiently great to warrant a request for particulars. While on this subject, I would inquire if some one who has experience cannot give an itemized estimate of this house (I mean carpentry only) for the sake of comparing views. I will be very glad to contribute what I am able, although I do not lay claim to special experience.

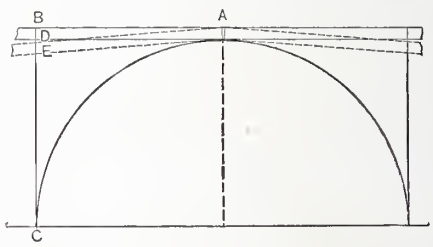
From H. E. D., *Roseland, Ill.*—I am rather astonished at $700 for a dwelling-house as designed by Mr. Ayars and published in the December number. Building material and labor must be much cheaper in his vicinity than it is elsewhere. He specifies as follows:

Mason's material and labor	$208
Lumber	360
Tinning	60
Carpenter's work	72
Total	$700

Where do the hardware and painting come in, or are those parts furnished by the owner? I should like to have this subject ventilated in the paper, in order that the public may know that a house like the one described costs more than $700.

From M. J., *Butler, Penn.*—The cheap frame house contributed by Mr. Elias Ayars in the December number, will no doubt meet the requirements of a large number of subscribers. I notice, however, that the architect, in giving his estimate, has omitted painting. The house described, built in this locality, would cost $900. It is possible that the difference can be accounted for in the difference in prices of material between the two places.

From H. G., *Ridott, Ill.*—I want to give you an estimate of the plan for a cheap frame house contributed to the December number by Mr. Elias Ayars. In the schedule of estimate published I find mason's material and work, lumber, tinning and carpenter's



Kerfing.—Fig. 3.—Sketch from E. E.

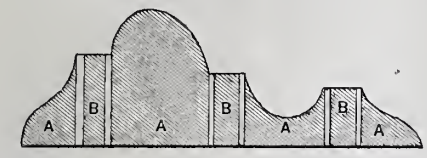
work, but I do not see any allowance made for hardware or painting. The latter is described as three-coat work, but it is evident there is no money left to pay for it. In this part of the country we cannot get painting done without paying, and hardware also costs money. I will give you an idea of what the same building would cost in this city.

Mason's work	$185.00
Lumber, sash, doors, &c	310.00
Hardware, including pump	42.50
Painting and material	65.00
Tinning	47.25
Carpenter's work	165.00
Total	$814.75

I raise the question whether or not the carpenters of Hornellsville desired it published to the world that they are ready to build such a house for $72. With such a state of affairs it is no wonder that carpenters complain they do not get wages in proportion to other mechanics.

From E. H. C., *East Rochester, N. H.*—I think the estimate of cost upon the cheap frame house in *Carpentry and Building* for December is "rotten at the heart," and has a tendency to do an injustice to builders. Mr. Ayars has given us a convenient arrangement for a cheap house, and no doubt it will be of value to some of the readers of the paper. He presents an estimate in detail, showing the cost to be $700 in the aggregate; $72 only is allowed for the carpenter work. Now, it does not look reasonable that all the woodwork on this job was done for this sum. Again, he has omitted all allowance for painting. The question arises, did the carpenter do the painting, and was the bill for the lead, oil, &c., included in the item entitled "lumber?" I notice also that hardware is entirely omitted. Mr. Ayars says there was a sink and pump, but does not say anything

about the cost of the same, with all the necessary pipe and fittings. I presume the carpenter must have put down the well, as there is such a liberal allowance in his figure. Carpenters in general like to do little extras of this kind when opportunity presents. I might mention other items that must have cost something in the construction of this cheap house, but which do not appear in the schedule of the estimate. Carpenters are so willing to work for nothing and find themselves, that to give them more than half price for a job might be an unnecessary waste of money. In all seriousness, I claim that the



Bending a Molding.—Fig. 1 of Sketches from D. M. W.

publication of an estimate of this kind is calculated to do more harm than good to the trade in which we are working. I trust the subject will be ventilated through the correspondence department of the paper in a way to show the actual cost of the building, and also to set a fair price at which a house of this kind is to be built.

From M. P. S., *Baltimore.*—The December number contains a design for a cheap frame house, costing $700. I desire to ask, where did the painting, glass, hardware, &c., come from? They did not appear in the schedule of the estimate.

From ELIAS AYARS, *Hornellsville, N. Y.*—received the Editor's letter, saying that the publication of the house design and estimate in the December number had called out a number of criticisms, and that the estimate was deemed insufficient by a number of practical builders. In reply I would say that I sent the estimate of the cost as the contractor

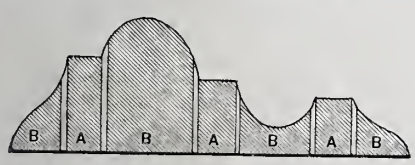


Fig. 2 of Sketches from D. M. W.

gave it to me. The publication of my name with the design has brought a number of letters and postal cards upon the same subject. I saw the contractor this morning, and he gave me the figures or estimate as he calculated the job when he took the contract. They are as follows:

Mason's work and material	$203.co
Pine, lumber and hardware	196.50
Windows	46.00
Doors	25.co
Painting	80.00
Cistern	10.00
Privy	14.50
Carpenter work and tinning	125.00
Total	$700.00

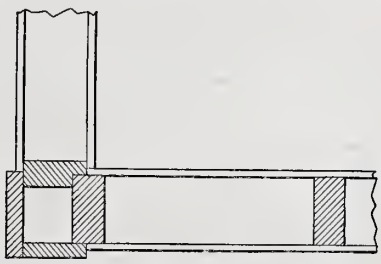
Siding and flooring were figured at $21 per thousand. The contractor says, in explanation, that when he gave me the schedule of his estimate at the time I sent the design he did not consider the matter of any importance, and in haste grouped the items as I sent them in. The house was built for $700, as was stated in my former communication. Whether the contractor made anything on the job or lost money I cannot say, but he says that he is willing to take a duplicate for $750. In this connection it is proper to say that material has advanced some since last spring, when the house in question was built. If I ever have occasion to send another design and estimate I will be more particular with reference to items, for I see that everything is very closely scanned in the paper.

Bending a Molding.

From D. M. W., *Caledonia, Mich.*—In answer to J. H. H., of Mount Clair, W. Va., who inquired in the September number for a method of bending a straight piece of molding over the casing of a segmental head, I will explain how to do it. Take a nice piece of molding and rip it into strips, as shown in Fig. 1, sawing the pieces marked A. The intermediate piece marked B cannot be used, for the amount cut out by the saw has come off from them. Accordingly, take another piece, as shown in Fig. 2, and saw it in a similar manner, but making the saw cut come from the other set of members, thus producing complete pieces corresponding to those which were lost in the first operation. With the strips in this shape they may be bent as required when it is necessary, as in a short curve I saw in at the inner edge of each strip.

Corners of Frame Buildings.

From H. L. B., *Grand Ledge, Mich.*—I inclose a rough sketch of the way I have learned to make corners for frame buildings. I take 1 inch out of the corner of one stud, as shown in the diagram, and then nail it on to a whole stud. By this means a solid corner is formed, which will not crack. A 5-inch corner-board is wide enough to finish the corner. In studding partitions I nail two



Corners of Frame Buildings.—Fig. 1 of Sketches from H. L. B.

studs together, as shown in the second diagram. I contribute these sketches as being of possible interest to your readers, after what was published in the November number of the paper.

Some Economic Problems.

From R. B., *Columbus, Ohio.*—I have read with interest the practical articles on stair-building, and have no doubt I could give suggestions as to simplification which would be of value to your readers. I have charge of the stair-building department of an extensive factory in this city, and have had eight years' experience. I decline, however, to give away valuable information that I have been years in acquiring, and which might be working myself out of employment. If the producing power of carpenters generally were increased to double its present extent it would not add anything to their wages. To explain, it is estimated that the producing power of labor has increased fifty-four times

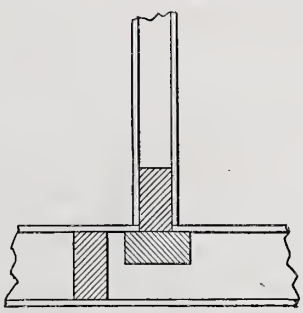
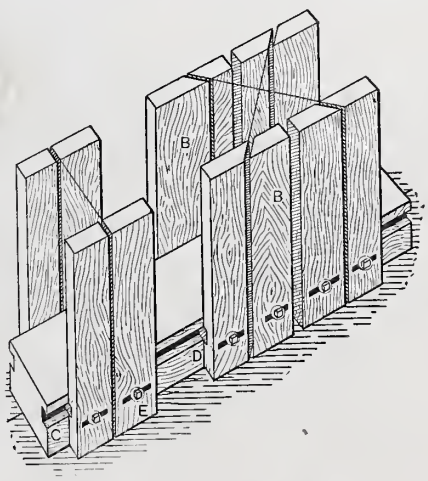


Fig. 2 of Sketches from H. L. B.

in the last hundred years; in other words, one man at the present day, with the aid of labor-saving appliances, will produce as much as fifty-four men one hundred years ago without such aid. There certainly is greater production, but wages are no greater and interest is no greater. The question arises, where has the gain gone if labor has not got it and capital does not get it? My answer is that all this has simply gone to increase the value of land. The more industry and the more progress that has taken place in the world, the more the value of land has increased. This furnishes the key to a question that has been discussed time and again without reaching a satisfactory conclusion. It explains why mechanics do not take interest in the books treating upon their trades. They may not understand the philosophy of the question, but they certainly appreciate the facts.

Note.—We might reply at considerable length to this correspondent's letter, but we doubt very much if our remarks would have any effect upon him. His arguments are so specious and his position so easily combatted, that we feel disposed to refer his communication to men of his own class, who see things much more clearly than he does. Assuming for the sake of argument that his statements in the main are correct, we cannot refrain from asking him the question whether he would be willing for himself and those dependent upon him to go back one hundred years and live as his ancestors lived at that time. Assuming that wages are no better to-day than one hundred years ago—which we are not prepared to admit—would our correspondent be willing to exchange his position in life for that of a man similarly situated who lived one hundred years ago? We trust some of our practical and matter-of-fact readers will challenge the position of this correspondent, for his benefit and the benefit of others who are similarly perplexed in some of the problems of every-day life. Ordinarily we would not encourage the discussion of questions of this kind in our columns, believing they are somewhat outside of our particular field, but when they



E. W. C's. Wooden Miter Box.

become linked with such a practical matter as the giving of information by one man to another, they are deserving of attention.

Adjustable Wooden Miter-Box.

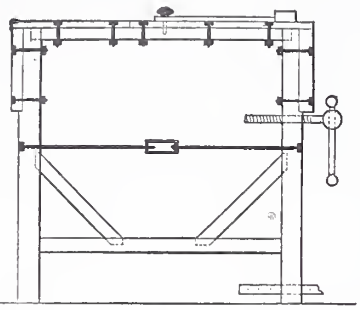
From E. W. C., *Randolph, Mass.*—Some time since, J. H., of Worcester, Mass., made some inquiry about miter-boxes. No doubt others are able to make a better answer to this query than myself. However, I am able to give my opinion, and that is that iron miter-boxes are much the best. They will not answer in all cases, for they are not high enough for some work. I inclose a sketch showing the construction of a miter-box, which is original with me, and represents an article which I employ for mitering door frames, when the depth is 5 or 6 inches. The box is made of 3-inch plank for the bottom, A, with a groove on each side, indicated by C in the sketch. This groove receives a square piece of wood, D, glued to the uprights B, and made fast by square-headed wood screws provided with washers. The upright B has a small groove to make it adjustable. This upright is made of hard wood, and extends 10 inches above the bottom A, making a perfect guide for the saw. With this box I use a 26-inch saw of twelve teeth to the inch, having very little set. I hope the diagram inclosed will be of interest to your correspondent who asks the question and others.

Splicing Ropes.

From L. R. H., *Argyle, N. Y.*—It often becomes necessary for mechanics to mend a broken rope, and I doubt if there is one in a hundred who can do it properly. I remember that the foreman in charge of the work on

Congress Park, at Saratoga, failed in an effort to find a man who could make a splice among 30 men who were at work for him. If you will illustrate by an engraving the most practical method of splicing or joining a broken rope, you will confer a favor on one who lives far from a seaport town, aud probably many others of your readers.

Answer.—The subject of splicing a rope is so important for the mechanic, and he has so few opportunities of learning how to do it, that, at an expense of much time, we have taken up the subject at some length. We found it necessary, however, to begin at

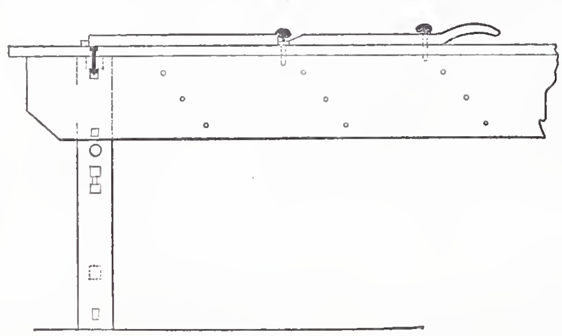


AX's Workbench.—Fig. 1.—*End Elevation.*

the beginning of the subject of ropes, knots and splices. As what we wish to say is much too long for the correspondence department, we have put it into a series of articles.

Portable Workbench.

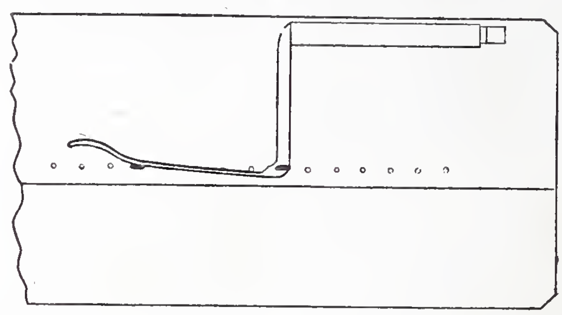
From AX, *Bowling Green, Ohio.*—I am employing a portable workbench provided with a spring for holding the work to the head block, or "bench dog," as some call them, a description of which will possibly be of interest to the readers of the paper. The accompanying sketches explain the manner of construction and will make the following description understood. I make the top of the bench in two planks, differing in width, however, so that the joint will come at least 2 inches out of the center of the bench. I dowel the planks with ⅜-iuch iron pins and bolt them securely to a 2 x 2 batten, using for this purpose ⅜-inch carriage bolts. The battens at each end are furnished with a 1 x 2 tenon that fits in the top of the bench legs. The legs and cross-bars, also the braces, are made of seasoned hardwood of the fol-



AX's Workbench.—Fig. 2.—*Side Elevation.*

lowing general dimensions: legs, 3 x 5 inches, cross-bars, 2 x 3 inches, braces, 1 x 2 inches. The legs are gained into the sides ⅜ths of an inch, and are fastened with bolts the same as the top. The heads of all bolts are counter-sunk in the face side of the planks. I frame the cross-bars and braces neatly and to fit at either end. The swivel rods are made of ½-inch iron, with a strong thread and a square head at each end. The ends of these rods are counter-sunk in the legs to keep them from turning. The end of the rod that has the swivel upon it is put through the leg from the inside 2 inches above its position and dropped down into a slot to its place. By turning the swivel, the bench can be made very solid and firm, provided the parts have been properly framed. To move the bench, all that is necessary is to unscrew the swivel which separates the bench into its parts. The parts are, the top, the two sides, and cross-bars and braces. The braces may be hinged to the cross-bars so as to prevent their being misplaced. A bench of this kind, properly constructed, may be made to last a lifetime, provided care is taken of it. It can be easily moved through doors where a common bench would not go, and can be taken down and set up in five minutes by one man.

What I wish to call especial attention to is the spring which I use, instead of that old bench destroyer, the bench kuife. It is very simple and can be made at any blacksmith shop at a cost of about 75 cents. It is plainly shown in the plan. The spring is made of ¼-inch spring steel. A broken carriage spring answers a very good purpose. Have the length of the blade equal to one-half the width of the bench from the pin-hole or nearly so. Draw the front part of the blade to an edge. Turn the end of the blade up and weld the handle firmly to the part turned up at right angles to the back of the blade. Draw a line through the center of the bench, or, say 20 inches from the edge of the bench if the bench is a single one, and on this line bore seven 16-inch holes through the top at intervals of about 3 inches. A ⅜-inch



AX's Workbench.—Fig. 3.—*Plan showing Spring in Position.*

iron pin through the blade near the handle acts as the fulcrum, and the handle, by being sprung inside the line of holes with another iron pin placed behind it, acts as the lever. The device will hold any ordinary work very firmly, even for traverse planing or for using a firmer or dado plane. To release the work, all that is required is to lift the handle over the pin. If a number of pieces of equal length are to be worked, which is oftentime the case, the change from one piece to another can be made in a second of time. The blade of the spring being only ¼-inch in thickness, thin stuff can be planed without the spring interfering with the tools. The bench here described and the spring are both my owu invention. I have employed both of them over two years, and a great part of that time have been working in hard wood. From the satisfaction they have given me I can recommend them to my fellow-workmen.

Criticisms on the Ten House Plans.

A very large number of our subscribers in forwarding their ballots in the decision of the fifth competition, have taken occasion to express their views of the scheme and to comment on the plans submitted. Almost without exception the general tenor of their remarks has been complimentary and highly flattering. Not a few of the writers have asserted that the plans printed in the February number are alone worth the year's subscription to the paper. We mention these facts only because we desire to present at this time some letters of an opposite character which have been received. Upon the policy of allowing both sides to be heard, we have been in the habit of publishing in *Carpentry and Building* the adverse criticisms which our efforts have called out. Pursuing the same general plan in this case, we direct the attention of our readers to the following letter from a correspondent whom many will remember as having criticised the results of former competitions.

From A. D. N., *Worcester, Mass.*—Of course I am interested in the prize designs. Other architectural papers publish the names of the committee who decide their competitions. I should like to know the names of the three competent committees who gave those ten plans to the world. I was happy to read the invitation for criticism extended. At least six of the plans have furnaces, which I loudly condemn. I never knew a furnace to work well in all kinds of weather. They always furnish a small amount of heat for the fuel consumed. Besides this, a cellar containing a furnace is always pervaded with a slimy kind of dampness that makes one shiver to think of. The proportion of usefulness between a furnace and a steam boiler for heating purposes is the same as between a hot air balloon and a hydrogen gas balloon. A steam apparatus gives perfect satisfaction when rightly put up. I do not take any stock in the romance usually attached to a fire in an open grate. The fire looks well, especially as it is stylish, but lots of dust is made, and although the ashes may shoot down into the cellar, the coal don't shoot up worth a cent. Some lunatic suggested some time since wrapping up the coal in bits of tissue paper. Perhaps he is related to the projector of No. 97. I am talking about the fire, not the mantel. A niche may be made in the wall under the mantel in which to place a steam radiator. Paint the latter red and then I am happy. By using steam for heating and doing away with the open grates, one chimney will suffice for this house. The chimney should have three flues, one each for boiler, ventilation and kitchen and laundry. In none of the plans submitted has there been made any provision for a gas machine in the cellar? This, I believe, is a necessity. With these general remarks I will proceed to take separate notice of each set of plans published.

If Number 91 has the entrance on the north side, the house will look very well with the tower on the corner, but there will be no entrance from either street, which would be bad. This house would look odd if it fronted to the east, and it does not seem to be designed for the position. It is a nice place to unload coal at the front door. Could not a hopper be constructed in the parlor floor and shovel the coal in that way by means of a window? This house, too, is a poor one for the hired girl. The pantry is a long way from the dining-room, and the washerwoman would be totally exhausted after lugging the clothes out of the cellar. The girl will probably rebel against pumping water and washing dishes beside the range. Everybody knows the girl would be a victim to consumption after an hour of the above mentioned work if she should pass out on the "servants' piazza" and be struck by a cold breeze from the refrigerator.

Number 138 is a nice arrangement, and it will probably take a prize. I should prefer different angles for the corners of the parlor and bay-windows. The closet for the sitting-room might be under the stairs. Where is the hot water to come from? The cellar is

not very well lighted, and the coal wagons will have to come into the front yard.

The author of 208 must like to eat his hash warm during the cool summer months. When a man calls the dining hall one of the principal living rooms in a house, set him down as a glutton. Two pair of stairs to the second story and only one poor crooked flight to the cellar.

Since Number 29 must have two flights of stairs to the second floor, why not replace one flight with a hand elevator? Even a cat would get lost in his cellar. I think this author must have caught the æsthetic craze. I wonder if sunflowers are intended to be grown in the winter garden. The parlor is poorly lighted.

Number 3 has another red-hot dining room, but then there are two pantries, and accordingly I think there will be plenty to eat in that house. Better have a glass door to light the hall. In this connection I would say that I do not like the kind of door illustrated in the January number.

Anchors for Building.—Fig. 1.—Section showing Shape of Wrought Iron Strap.

Number 191, I think, will have a few votes. Two rooms in the cellar look dark and damp. The closets are nothing to brag of.

Number 6 is neat and cosy, and ought to take the second prize. However, I want the tubs put down in the cellar.

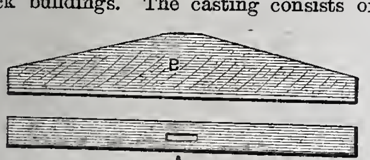
Number 97 has but one water-closet in the whole house. There are chimneys enough for a rolling mill, and the cellar is all dust and ash pits. Such an admirable system of drainage! That "shute" is immense—a nice fire-trap withal. Pleae don't drop the baby down.

Number 58 has plenty of stairs to fall down for a small house. Perhaps this plan will have a vote.

Number 69 will probably take a prize. I do not like the bay-windows. The roof of the dining-room bay-window is omitted on the second-floor plan. Is stained glass considered a modern improvement?

Anchors for Building.

From W. W. T., *Watertown, N. Y.*—I inclose some sketches showing the shape and method of using a cast-iron anchor head for securing the floor timbers to the walls in brick buildings. The casting consists of a horizontal plate, B, Fig. 3, with upper and lower flanges of the general shape shown by A. A slot, through which a wrought-iron strap passes, is also shown in A. In practice the anchor head B, Fig. 2, is made about ¼ inch in thickness, and the flange A is proportioned with reference to it. The wrought-iron strap, as shown in the perspective sketch by C, passes through the flange A and is bent downward, as indicated in the section of Fig. 1. I believe this anchor head has some merits worthy of consideration. As the hold upon the wall depends vastly more upon the horizontal length than the vertical hight, the head may be made of any convenient length. The pattern which I use acceptably is 30 inches long. The increased width of the horizontal plate in the center gives it much more strength than is apparent at first sight. The vertical and horizontal plates take the place of the mortar in vertical and horizontal brick joints, and make the least possible work in coursing and banding. A cast-iron head is preferable to wood, because it will neither shrink nor decay. Boiler plate with one vertical flange may be used instead of cast iron, if preferred. I am aware that in the best construction several different devices are employed for allowing the ends of timbers to become detached without injuring the walls in case the floors are crushed or burned out, but common and cheaper methods are still preferred in many cases, in which the utility of the device above described will be apparent to your readers.



Anchors for Building.—Fig. 2.—Shape of the Head.

A Correction.

From J. B. T., *Fond du Lac, Wis.*—In the description of my ladder in the December number an error occurs. When we begin to spread the ladder by lengthening the rounds, the first long round spreads the sides ⅛-inch, the second ¼-inch more than the first, or ⅜-inch, the third ⅜-inch more than the second, the fourth ½-inch more than the third, and the fifth ⅝-inch more than the fourth, thus increasing the spread ⅛-inch more at each round than the last one above it. Fig. 2 of the illustrations should be turned over so that the inside ladder would be at the top.

Policy of the Paper.

From A. W. W., *Toronto, Ontario.*—Believing that the Editor of *Carpentry and Building*, in common with all other good editors, desires information as to the wishes and opinions of his readers, I beg to say, on behalf of several Toronto carpenters and for myself:

1. That the information printed upon building matters is seldom of a sufficiently practical character to be really useful, either to the young or to the experienced carpenter and builder.

2. We think the Editor lessens the value, to us, of the journal in printing matter not connected with its stated purpose, as expressed in the title and prospectus.

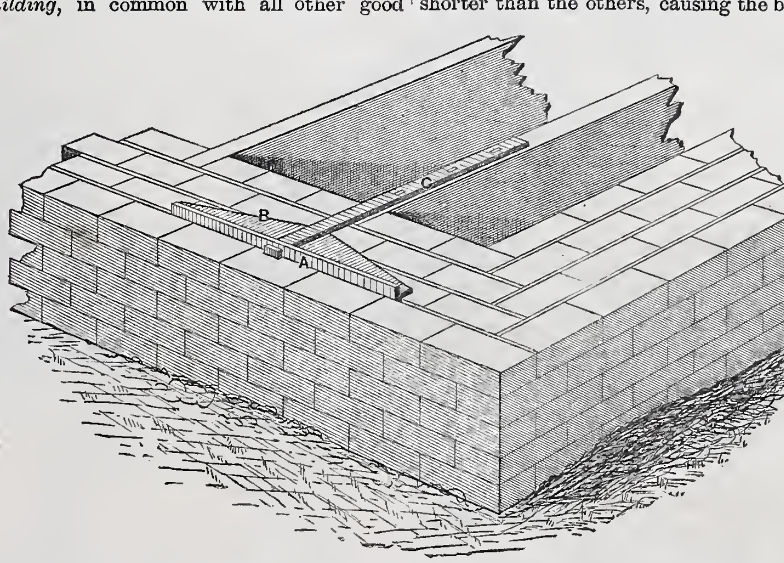
3. Subjects such as tracery for church windows, gothic frames and gothic roof framing, stair-building, from newel post to landing, with full and concise information thereon, are what we wish to be instructed in.

4. We do not want to be talked to by amateurs, but instead by the Editor. We look to him, and not to correspondents. We seek to know what he thinks is right and practical, and not what inexperienced and untrained men think.

5. In short, we want the Editor to give us reliable instruction, information and advice. All that comes from other sources we neither care for nor pay for.

Note.—The changes suggested by our correspondent are too radical to be made all at once, even if they were deemed entirely desirable; therefore we shall persist in our old plan for a little while longer, at least until our readers have had the opportunity of perusing his communication. In the mere act of publishing his letter we of course plead guilty to several of the indictments above.

We feel highly flattered at the writer's good opinion of the wisdom and sagacity of the Editor, and we feel sorry to do anything that will lower us in his estimation. Our judgment is, however, that our wisdom is better shown in the management of the paper upon the general plan which has led to its present success, than in ventilating our own opinions upon every subject raised, which is evidently desired by the writer. We are always ready to meet the views of a majority of our readers, and are conducting the paper as at present because we are assured that it pleases.



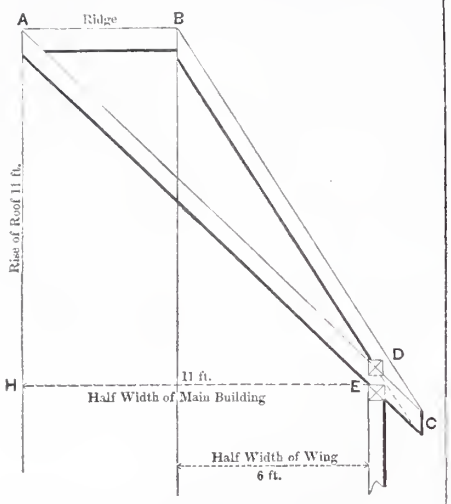
Anchors for Building.—Fig. 3.—General View showing the Application.

Saw Benches.

From A. A. F., *Cleveland Ohio.*—The first thing necessary for a carpenter to have after getting the lumber out of which to construct a job of work, whether it be in the shop or out of doors, is a suitable place whereon to lay it for cutting in the proper lengths and widths. For this purpose saw-benches are commonly employed, but what kind of benches do we find in use? Like the workmen who use them, the good ones are in the minority. We often find them made of a piece of 2 x 4 scantling, with the legs tapered with a hatchet to give them the necessary spread, and nailed on with three or four nails without braces of any kind. Then again, we find them made of 4 x 4 or 6 x 6, with holes bored through and round sticks inserted for legs. In some cases one of the legs has worked up an inch or so, so as to be shorter than the others, causing the bench to rock and sometimes topple over while being used. Some of the saw-benches in use are too long for convenience in the shop, having been made for framing timber out of doors. When once made, however, they are used for all purposes, for the time cannot be afforded for making others, so long as the present one will stand up. One is too high, another too low. The most of them are poor, loose-jointed, rickety affairs at the best. It requires the skill of a tight-rope performer to keep his balance while standing on one of them to case a door or window. Many bosses send their men out to do work that will take several days to perform, or perhaps weeks of time, without providing any saw-bench whatever. If a man can find an old crazy wash-bench, a dry goods box, or a condemned chair upon which to work, he is lucky.

I have found that the most profitable work that I can do for my boss under such circumstances is, first, to make a suitable saw-bench of good quality, and, when once made, to take care of it. It is just as essential to have a good pair of saw-benches and a good workbench as it is to have a good saw, hammer, or plane. My ideal of a good saw-bench is as follows: For the top I would use 2 by 6 or 2 by 8 stuff, 3 to 4 feet long; 3 feet 6 inches is a very good length. This I frame so as to have the side up, not the edge. I want the top as well as the legs to be of sound, straight-grained stuff, and planed on the four sides. To get the spread for the legs, I gauge a half inch from the top and nothing at the under side. I then saw in and take off the corner, beginning 3 inches from the end and running 4 inches toward the center. This gives the legs a

slant of ½ inch in 2 inches, and leaves them full strength and thickness at the top ends. For legs I use 1 by 4 inch stuff, 2 feet long and nail them firmly in position, and then with a long piece of 1 x 8 or 10 inches I connect each pair of legs, fitting the piece snugly up to the 2 x 6 top. After the saw-bench is well nailed together in this manner, I stand it on the level floor or on my work-bench and scribe the feet and saw them off, so that it shall stand just 22 inches high measuring vertically, and not along the pitch of the legs. I take great care that it shall stand true and level before scribing. Finally, I saw the upper ends of the legs off level with the top. By this means I have a bench upon which I can stand, in order to case a



Joining Roofs of Different Pitches.—Sketch from D. H. J.

window or door, with some degree of safety. If I need to saw off or rip through a board that is too short to use on two benches, I have some chance of holding it steady upon a bench of this kind. A bench such as is here described will cost but a trifle more in time or lumber than a poor one, while with proper care it may be used every day for five years before a new one will be required.

Joining Roofs of Different Pitches.

From D. H. J., *Danielsonville, Conn.*—I have looked over the method of joining roofs of different pitches presented by T. H. C., and I consider it a good one. In some particulars, however, I fail to comprehend it. I do not understand how he makes one-third pitch on a building 16 feet wide, 6 feet 2 inches. Calculating in the manner customary in this section, the hight would be 5 feet 4 inches. Again, the correspondent mentioned has his plates on both main and wing building on the same level, which will do if there is not much difference in the hight of the roofs. I inclose a drawing illustrating a case where this would not work. The main building is 22 feet high and the wing 12 feet. Having located the main plate, I draw the rafter at the proper angle, which in this case is 45°, and having allowed 15 inches projection for the cornice, I next draw the wing rafter from the same projection of cornice to the point where one-half the width of the wing meets the ridge. This gives the proper angle for the wing rafter. It is necessary to carry the wing plate up considerably in order to have it support the rafter. I carry it up where the weight of the rafter outside of the corner plate will be the same as in the other case. The sketch inclosed shows the method employed in a building recently put up by me. I had only the floor plan from which to work, and it was necessary for me to make the elevation myself. I have had roofs where the wing plate was 13 feet higher than the main.

The Stair Building Articles.

From C. F. R., *Seattle, Washington Ter.*—As a practical stair-builder and one familiar with most of the books that have been published on the subject, my library in that department having cost me upward of $50, I desire to say that I consider the stair-building articles now running in *Carpentry and Building* better adapted to the wants of beginners and the trade at large than anything I have ever seen. I commend them for simplicity, comprehensiveness, and clearness of expression.

From R. S. P., *Scranton, Pa.*—I am well pleased with the paper in general. "Practical Stair-building," I think, consumes too much space for the advantage gained to the reader. As problems in solids these articles might pass, but for practical hand-railing, never. However, they go to make up matter for thought, which is really a prime consideration.

What Mechanics Read.

From A. R. R., *Marysville, Ohio.*—I am surprised at the statement of Mr. Robert Riddell, that 95 per cent. of the mechanics of this country are patrons of dime novels and papers of fiction. I believe that I am in quite as good a position to judge of a matter of this kind as he is, and I do not find occasion for any such sweeping assertion. I would indeed be sorry to know that such an extreme degradation of taste existed in the minds of mechanics. My association with mechanics throughout this State leads me to think that Mr. Riddell's accusation is entirely unjust.

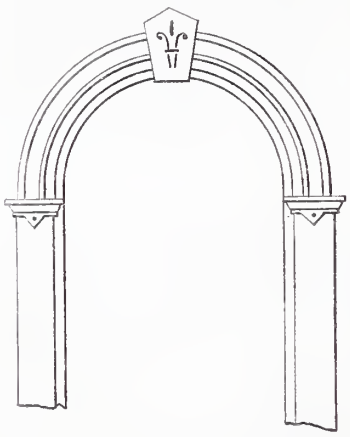
REFERRED TO OUR READERS.

Framing for a Hay Scale.

From C. R. P., *Globe City, Arizona Ter.*—Will some reader of *Carpentry and Building* who has had experience show, by means of a diagram, the method of framing and setting a hay scale? I desire working drawings which will enable me to proceed intelligently in my work.

Quarter-Wind Stairs.

From E. E. S., *Oshkosh, Wis.*—I am required to put up a pair of quarter-wind stairs in a queer space. The stairs are to be 4 feet 6 inches wide. It requires 22 steps to go up with 7½ inches rise and 11¼ inches



Awning Pattern.—Fig. 1.—Partial Elevation of the Window the Awning is to Fit.

run, with 18-inch cylinder and five winders. When I come to lay out the stairs I find that I can get only 20 steps in the dimensions. I cannot start any sooner nor can I land any further off, on account of room. My risers are too high now for comfort. My treads are narrow enough; consequently I cannot increase the rise or diminish the tread. The question I desire to ask is, where am I to put the two other steps in order to get up? I should like to hear from some of the practical readers of the paper in regard to this question.

Box Stairs.

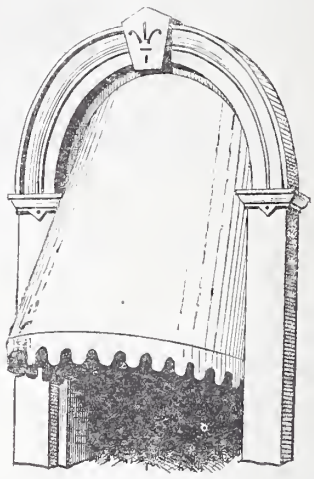
From T. W. P., *Hightstown, N. J.*—Will some reader give me a rule for putting up box stairs with four winders at the bottom?

Raising Roofs.

From W. P., *West Milton, Ohio.*—Will some of the readers of the paper present a method of raising heavy truss roofs? Also a method of fastening the same to buildings and plan of derrick for raising and placing on buildings.

Awning Pattern.

From H. L., *Cincinnati, Ohio.*—Will some practical reader of the paper please inform me how to lay out an awning frame for curved top windows, so that when the awning is down it will not be in creases or wrinkles? The way in which they are commonly arranged at present is to get the circle of the window and the distance the awning is to come out; then cut the shape out of paper, experimenting until the right form is obtained, after which the cloth is cut accordingly. It seems to me that such a form may be laid out by measurement, without first cutting a pattern in this manner, and without much fine figuring. I shall be pleased to hear from readers of the paper who have

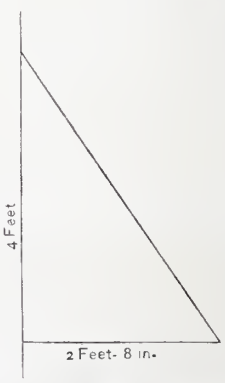


Awning Pattern.—Fig. 2.—Perspective View of Awning in Position.

had experience in this direction. There are many awning makers who cut their work on the plan above stated. All claim that too much cloth is wasted, but none of them know of any other way of getting the proper shape.

Cracking of Plastering.

From J. M. B., *Chetopa, Kan.*—I have just encountered a difficulty in a job of plastering which I desire to lay before the readers of *Carpentry and Builder*, in order that they may point out the cause of the trouble. The plastering in a $2500 residence which I am just finishing is cracking up badly. I have attributed it to extremely dry weather; yet it is possible that the fault is with the way the plastering was done. Heretofore I have always specified that the first coat should be put on roughened by raking diagonally, and left to dry thoroughly before the second coat was applied. This in turn had to become thoroughly dried before the hard finish was applied. The plasterers



Awning Pattern.—Fig. 3.—Diagram of Dimensions.

in this vicinity say that this custom of plastering is entirely out of vogue; that the idea is an exploded one; that all work is now done by putting on the second coat as soon as the first coat sets and before it is dry. I allowed this plan to be followed, and strongly suspect that is the reason of the cracking which the walls are now developing. I trust the readers of *Carpentry and Building* will understand my statements, and favor me with advice and suggestions.

CARPENTRY AND BUILDING

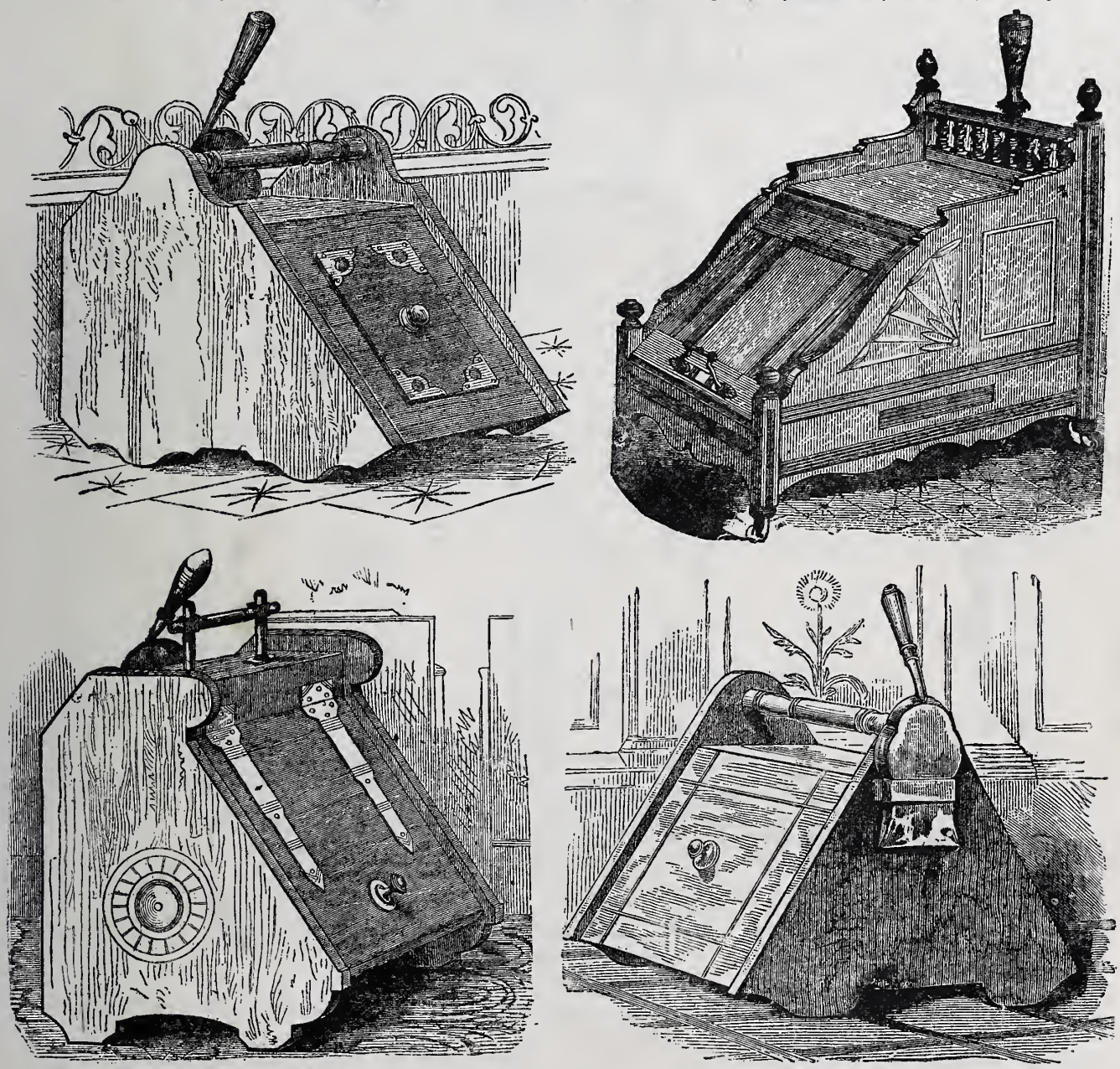
A MONTHLY JOURNAL.

VOLUME IV. NEW YORK = APRIL, 1882. NUMBER 4.

Wooden Coal Boxes.

Wooden coal boxes, a few designs of which we show upon this page from English catalogues, are in certain directions rapidly supplanting the metal vases and hods with which we have been so familiar for many years past. There is something about wooden coal boxes which harmonizes with the styles of wood finish now so popular in the better class of houses, and which is also in keeping with much of the furniture that is at present used. Various opinions may be expressed as to the relative merits of iron, brass and wood, for articles of this character. While each may have its advocate, the fact remains that iron, japanned and stenciled, has been in such common use for so long a time as to have lost its claim upon popular esteem. Brass is undoubtedly very nice for the purpose, and with proper surroundings adds a brightness to the hearthside not to be obtained in any other way. It has, however, the disadvantage of being quite expensive in the first cost and requiring a considerable amount of labor to keep it bright and in proper condition. Accordingly, brass coal hods and brass vases become mere articles of luxury rather than of general utility. Objections of this kind do not apply in an equal degree to the wooden coal boxes of the general character illustrated in our engravings. They are so arranged that the interior may be used in the roughest manner, while the exterior may be decorated to any extent desired. Brass hinges, brass handles, knobs and plates, in contrast with the back-ground of wood to which they are applied, add life to the design employed and make the article a very handsome room ornament as well as one of usefulness.

The special interest which articles of this kind have for our readers is that they may be constructed to advantage in any carpenter shop or cabinet-making establishment. There is such a variety of designs possible that any amateur, from the suggestions contained in our first-page engravings, can get up working drawings which would serve an excellent purpose. All the cabinet-making woods are suitable for employment, and the articles may be variously decorated, either by ebonizing, by polishing, by the use of carving, by the insertion of tiles, as well as by painting, should the taste of the persons making them run in that direction. The engravings sufficiently illustrate this general class of coal boxes and render further description entirely unnecessary.



Designs for Wooden Coal Boxes.

THEY WERE FORMERLY called brown-stone fronts; now "sand-paper" fronts is the name facetiously applied to them.

The Sixth Competition.

ELEVATIONS AND DETAILS OF THE EIGHT-ROOM HOUSE.

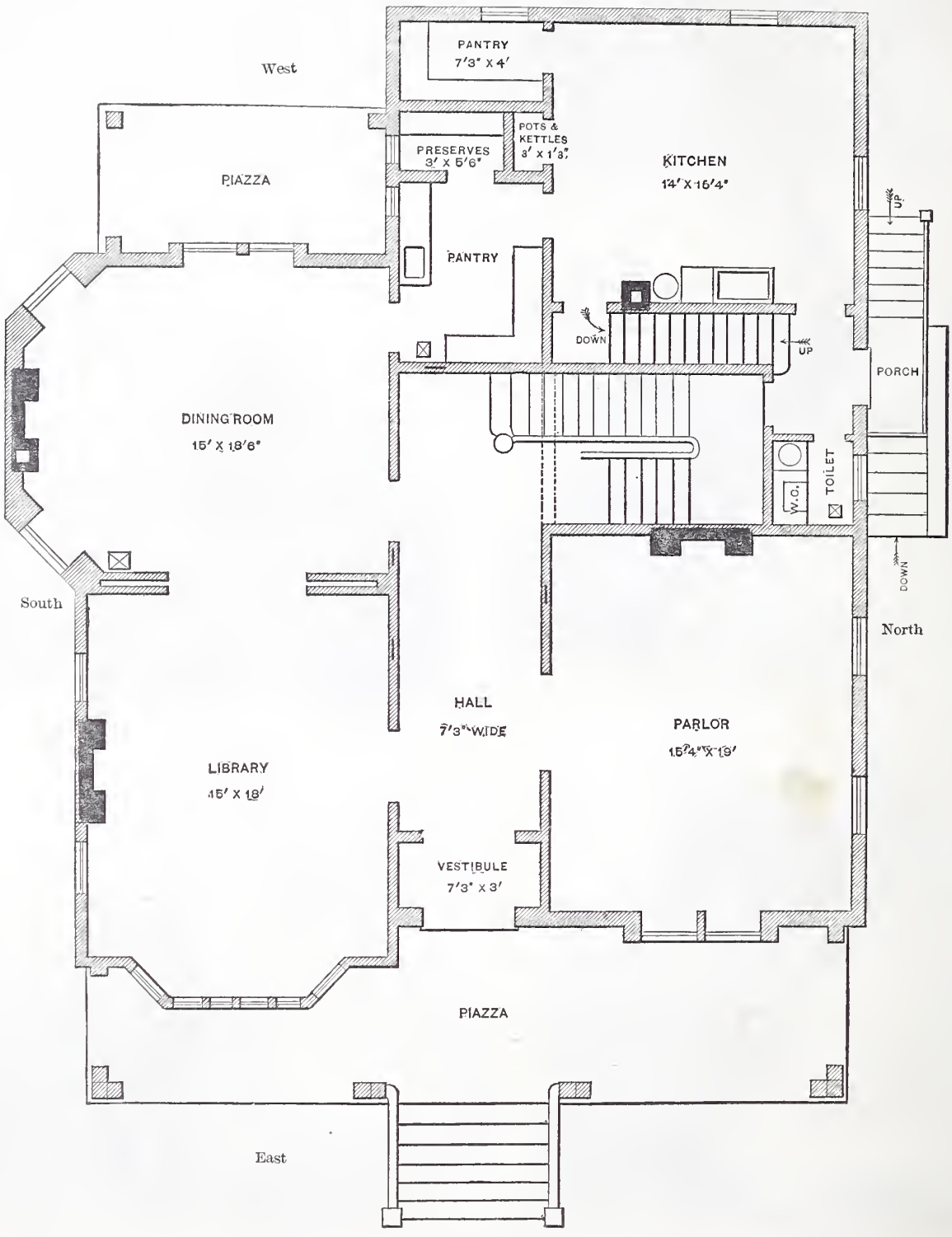
According to previous announcements in these columns, the next competition to which we invite the attention of our readers has for its subject the elevations and details of an eight-room house according to the plans receiving the first prize in our last competition. As the basis of this competition we present, on this and the opposite page, the first and second floor plans receiving the first prize in the last contest, engraved to the scale of one-eighth inch to the foot.

SPECIFICATION.

In this competition, as in the previous one, there will be no specified limit as to cost. We leave this matter with the competitors, in the same way as formerly, simply saying that the house in question should be designed in a manner adapting it to the wants of people of moderate means, rather than in an extravagant manner. The building is to be of frame. The style of architecture is left entirely to the discretion of the competitors. The contest will be one of design, appropriateness for the situation, and suitableness for execution by builders of average intelligence and experience. For the benefit of those who are not familiar with the advertized conditions of the last competition, we repeat the description of the lot on which this house is supposed to stand. "The location of the proposed building is an eligible corner lot, 75 feet front by 200 feet deep, situated in a village or in a suburban district. The front of the lot is toward the east, and the side toward the south. Little or no grading is required."

REQUIREMENTS.

Each competitor will be required to submit a front, a side, (south), and a rear elevation, an attic plan and a roof plan, all to the scale of ⅛ inch to the foot. A perspective view of the building as it would appear from the general direction of the street corner is also desirable, but is not made one of the essential conditions of this competition. Details of the interior and exterior finish are required at the discretion of the designer, drawn to a scale of ¾, 1½ or 3 inches to the foot, according to the nature of the parts represented. Perhaps the best description of requirements that can be given in this case can be made by reference to what we have heretofore published in this journal of work of the same character. It is the desire to obtain such details as will make the set of drawings complete for execution by any builder of average experience. The drawings may be in pencil, but ink is to be preferred. In whatever way they are prepared, they must be clear and distinct in all particulars. Each set of drawings is to be accompanied by a brief description, recounting the special merits of the design shown. This description is for use by the committee which will decide between contestants. Each design and the description above mentioned must be signed by a fictitious name or device. The same name or device is to be put upon a sealed envelope which shall contain the real name and address of the competitor. This envelope is to be inclosed with the drawings.



First Floor Plan of the Set Receiving the First Prize in the Fifth Competition.—Scale, ⅛ Inch to the Foot.

TIME.

Tho drawings in this competition may be sent by mail or express (charges prepaid) and must reach this office not later than May 31, 1882. They are to bo addressed to David Williams, Publisher *Carpentry and Building*, 83 Reade street, New York City.

PRIZES.

The prizos in this competition, as already announced, will be as follows:

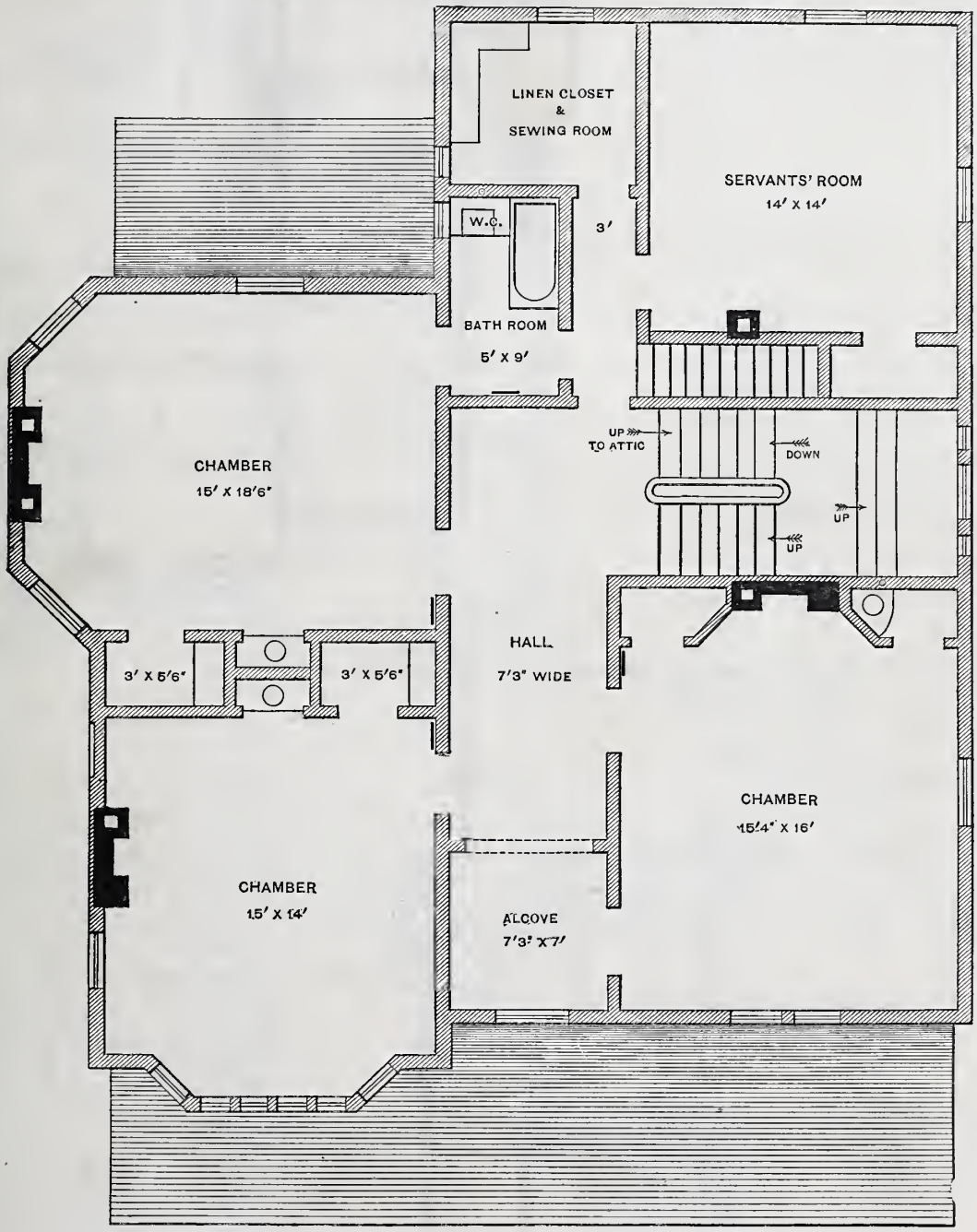
First prize	$100
Second prize	60
Third prizo	40

DECISION.

In this contest, as in previous ones, all the designs received up to the date of closing the contest will be put into the hands of a competent committee for examination. The decision we hope to announce in our issue for July, and if possible at that time, to publish one or more of the prize designs.

The widespread interest manifested ino ur last competition, in which over 200 contestants engaged, leads us to hope that the present contest will not be less popular, and that we shall have a large number of entries. The subject is one which appeals to the inventive ingenuity of architects in a peculiar manner, and as all the contestants and our readers generally will have the opportunity of comparing the efforts of different designers upon one common problem, the occasion possesses interest outside of the mere pecuniary reward suggested by the prizes.

How to Give Pine an Oak Color.—An exchange says: Wash the wood carefully in a solution of copperas dissolved in strong lye, in proportion of a pound of copperas to a gallon of lye. When the wood is dry, after having been thoroughly saturated with this wash, oil it, and it will look fresh and nice a year or two, when it can be restained and again oiled. Often, when not subjected to hard usage, the color will remain undimmed for several years, only requiring to be oiled occasionally. The color may be put on with a short brush, or the hands being protected with thick buckskin gloves, the wash may be applied with a cloth, which will saturate the wood more evenly. It will blister the hands if not well protected.



Second Floor Plan of the Set Receiving the First Prize in the Fifth Competition —Scale, ⅛ Inch to the Foot.

IN A PRELIMINARY REPORT upon electric lighting by Mr. Edward Atkinson, which has just come to hand, he points out one danger which the users of the arc lights should bear in mind and guard against. It appears that if a wire conveying the current is suddenly broken while the dynamo machine is in operation, the voltaic arc is extended while the ends of the wire are being separated, sometimes flashing through a distance of several feet. That is, if the wire is broken at such a place that one end can fall or separate from the other, what is called the electric spark will follow from one broken end to the other, from 1 to 6 feet, according to the power of the current generated. Of course, if one of the wires fell across wood, or loose, combustible materials like cloth or cotton, a fire would instantly occur. Such fractures may be caused by the breaking of belts or machinery. From this he draws the conclusion that great care should be taken in running lines of wires, and that they should not be carried crosswise beneath beams, nor in proximity to belts, shafting or pipes.

AT A RECENT exhibition of fire-escape models in New York, one was shown which was capable of being raised to the hight of 160 feet, and was provided with all the necessary attachments for saving life from buildings of any hight below 160 feet. Such an apparatus is all very well in the model, but when it is remembered that this escape must be supported in the width of an ordinary street, must be carried upon wheels and in weight must be light enough to be hauled by an ordinary team of horses, we find that the ladder, or telescope, or whatever it is called, is more likely to prove a man trap than a fire-escape. We have seen a number of pieces of similar apparatus, but must confess that most of them appeared to be exceedingly dangerous. While it may be possible to build a fire-escape to reach 150 to 160 feet, we think that the conditions are so exceedingly trying that it is hardly worth while for any single individual to undertake the task. A corporation might construct it, but we think it would be of doubtful value.

A Study in Floor Plans.

So much interest was manifested in the ten sets of floor plans published in our issue for February, that we have no doubt the several plans submitted herewith will be quite acceptable to our readers. We announced in a former issue that we proposed to publish some of the better plans received in the fifth competition which failed to enter the selected ten, and also a few of the poorer

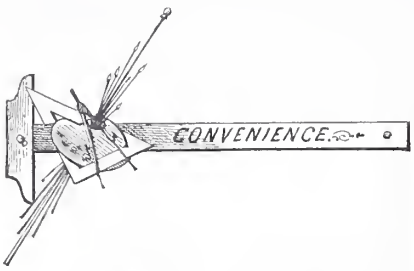


Fig. 1.—Fac simile of the Nom de Plume of the Author of the Annexed Plans, Figs. 2, 3 and 4.

plans received, for the purpose of criticism. Since announcing that we proposed criticising some of the plans, a very considerable number of the contestants have written, requesting that their plans should be published for criticism. We are gratified at receiving letters of this kind, for it indicates a commendable spirit upon the part of competitors, and also shows confidence in the opinions which this journal might express. It is manifestly impossible for us, however, to comply, to any considerable extent, with requests of this kind. While it would afford us great pleasure to go through in detail the entire list of plans received, pointing out merits and demerits and talking with our readers in a familiar manner about them, we feel that the interests of our subscribers at large demand that our space be devoted principally to a consideration of some of the better plans submitted, which may be of service to them in their regular business. We shall at this time, therefore, occupy but a very small space in considering plans in which defects are apparent.

The first set of plans to which we call attention was submitted by a competitor whose *nom de plume* is "Convenience," (No. 144). The drawings are to be commended for character of execution. They constitute one of the finest specimens of line work which it has been our fortune to examine in a long time. Contrary to our usual practice, the engravings in this instance have been made by the photo-engraving process direct from the originals, instead of re-engraving. Although the reduction is very considerable, the care and accuracy of the designer will be seen by an examination of Figs. 2, 3 and 4. Another evidence of the skill of this draftsman is afforded by the device upon which his *nom de plume* was written, a *fac simile* of which is presented in Fig. 1.

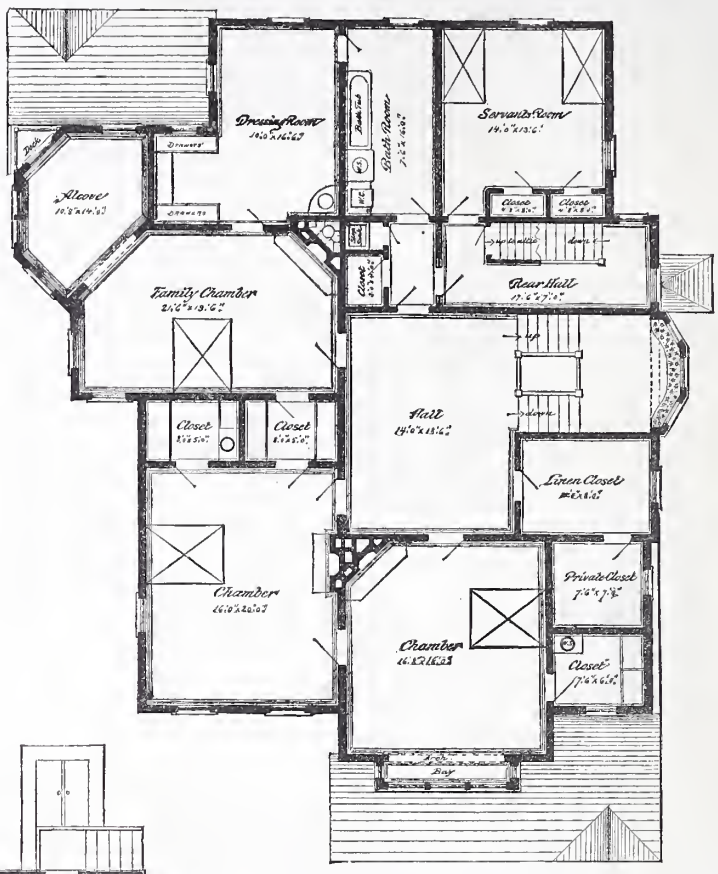


Fig. 3.—Second Floor Plan, by "Convenience."—Scale, 1-16 Inch to the Foot.

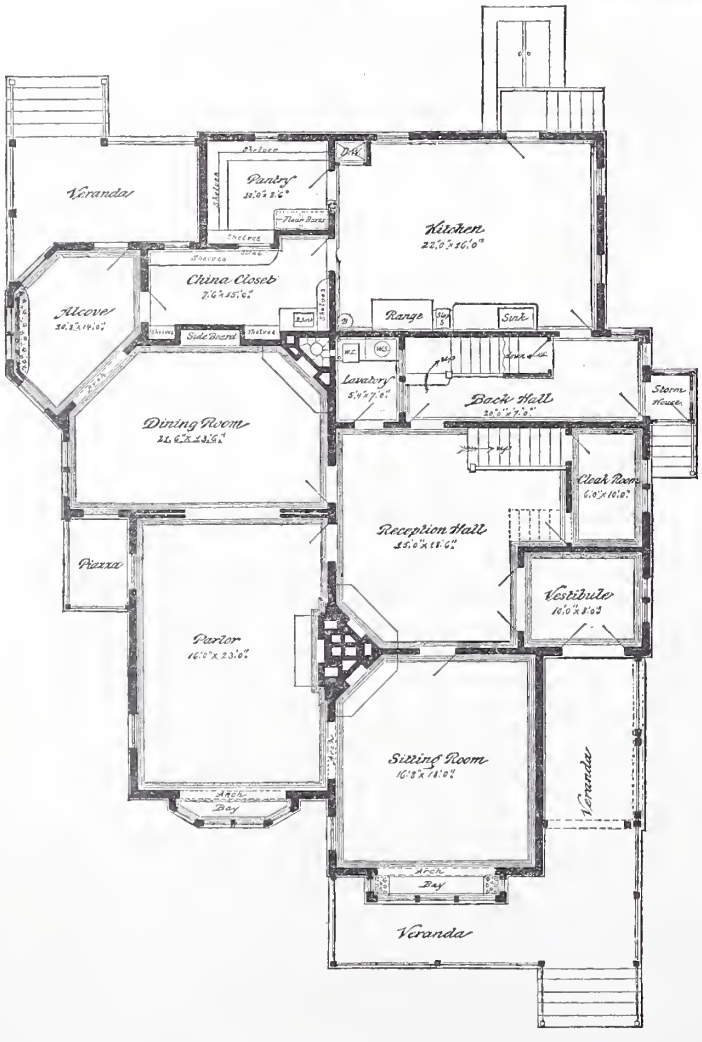


Fig. 2.—First Floor Plan, Submitted by "Convenience" (No. 144).—Scale, 1-16 Inch to the Foot.

It is not our purpose to point out the reasons why each of the sets of plans here presented were rejected by the several committees through whose hands they passed. We leave closer criticism to our readers, and, therefore, after commending the drawings submitted by "Convenience" to our subscribers' attention, we will only remark that the number of apartments shown upon his plans seems a rather severe stretch of an eight-room specification. It seems, too, a great pity that a design upon which so much care and study have been expended should have the service between the kitchen and dining-room through the alcove with which the latter apartment is provided, that otherwise would be a most delightful lounging-room prior to or following meal-time.

Figs. 4 and 5 are engraved from the plans submitted by "Plane Guide" (No. 133). This designer specially requested at the time of sending in his plans that they should be criticised for his benefit, and inasmuch as his plans are somewhat typical in character and represent in a certain degree the efforts of a large number of designers, both amateur and otherwise, we feel that it will be of interest to our readers to give special attention to his case. The general arrangement of the rooms is good. The dining-room bay window, opening to the east and west, makes that apartment a pleasant one, although it fronts to the north. This room, however, would have been better if it were wider. From 12 feet, as it is now drawn, there must be deducted the width of the chimney breast and the side-board, which is shown upon the plan, leaving a very small space for the dining table. The direct communication from the kitchen to the dining-room we consider objectionable. In this respect the plan might have been improved by extending the south end of the pantry and making the partition in the line of the dining-room and stair par-

tition, and then serving through two doors. The room thus gained could all have been used by extending the china closet to the outside west wall. This would have increased the shelf room and have given space for large drawers for table linen and the like. The door to the cellar, in this case, could have been placed in the south partition of the stairs.

Another criticism that might be made upon this plan is the direct communication from the kitchen to the front hall. A passage might have been arranged under the stairs and thus have secured two doors, or a part might have been partitioned off at the line of the well-hole. Kitchen odors throughout a house are not pleasant, and a little care in matters of this kind makes a house more agreeable than otherwise. We suppose it was an oversight that the drawings show no steps from the west or outside kitchen door.

The plan shows two bay windows, concerning both of which it may be said that they are too small. A good rule, in a general way, is to make a bay window one-half the width of the room with which it communicates. It is better, however, to make them larger than this, even though the windows are not carried to the corners. A room no wider than the dining-room in this case would be better if extended beyond the line of main house the full width, sufficiently to get side windows. Construction of this kind would not be more expensive than that indicated in the plan.

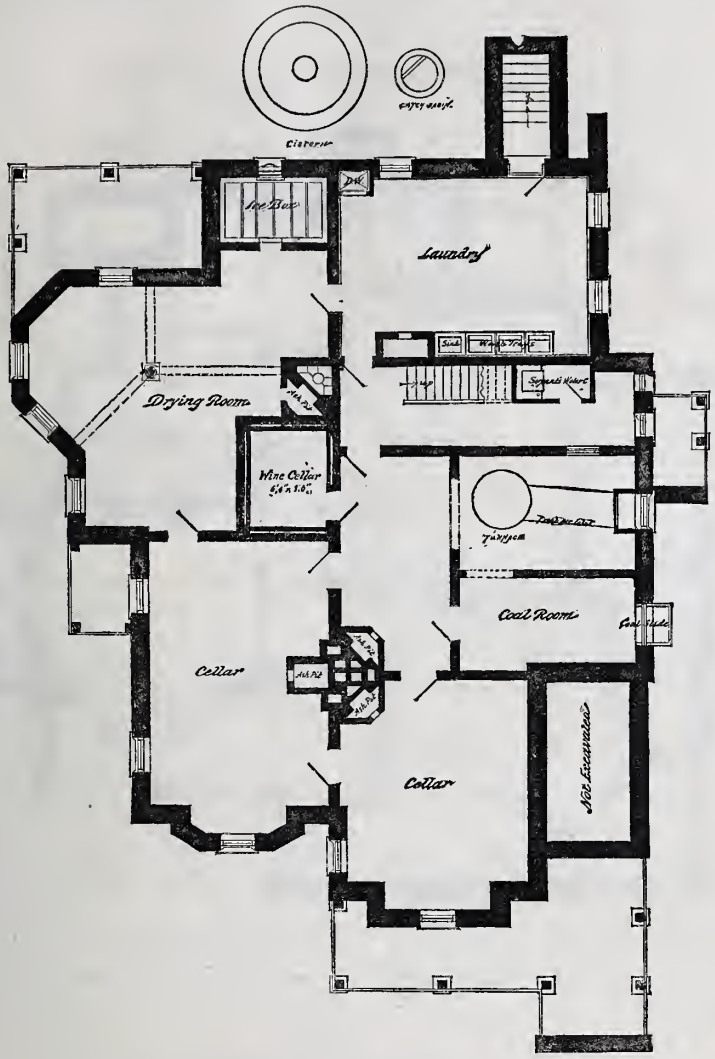
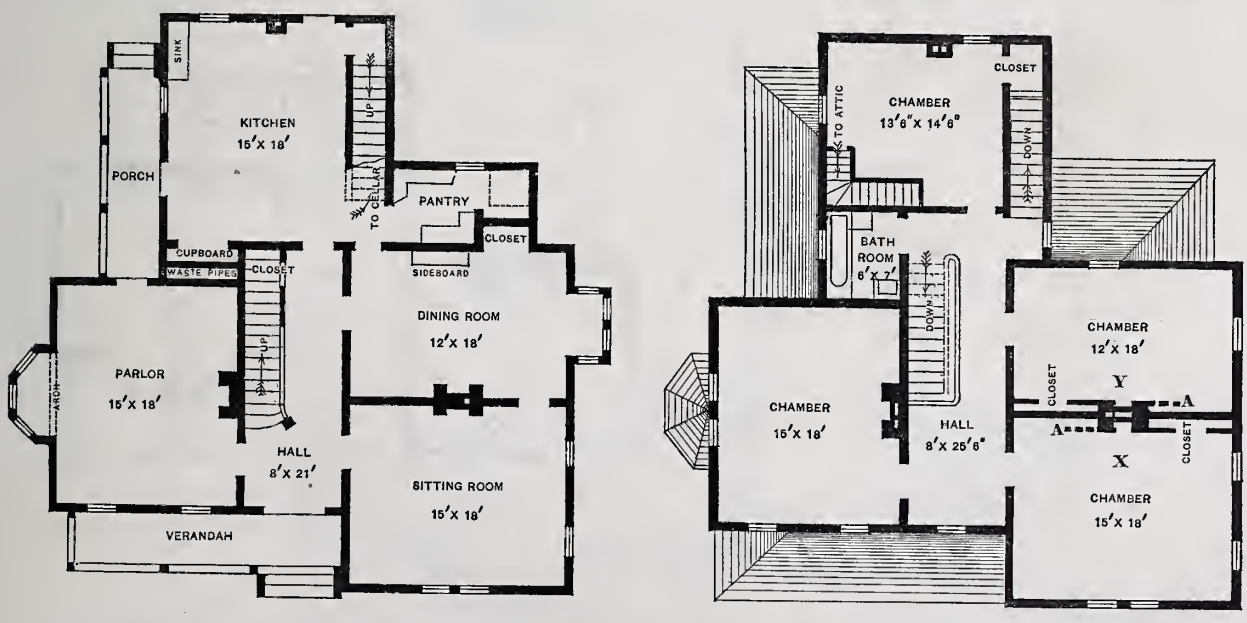


Fig. 4.—Foundation Plan, by "Convenience."—Scale, 1-16 Inch to the Foot.

Where there is abundant lot room, and the specification in this case afforded all needed space, we think porches and verandas should be wider than those shown in this set of plans. Our own feeling is that we would dispense with them entirely, rather than have them so very narrow. The presses or closets between the chambers on the north side are too small. They might be improved by making them as wide as the chimney, and making the partitions straight in both rooms. This has been indicated in the engraving by the dotted lines A A. It is possible that the designer endeavored to keep the second-story partition over the one below, but as the joists of the upper story in most designs would run the other way, this feature of construction is not absolutely necessary. We think it would be better if the stairs to the attic were started from the hall instead of from a bedroom, for obvious reasons. We should have placed the kitchen sink at the end of the kitchen, if there had been none provided in the pantry. Another improvement in planning such a house as this is to place the staircase on an outside wall to the light, and arrange the hall in such a way that, when desired, the main rooms can be connected, and the hall, even if small, furnished and used as a room. In the kitchen a very narrow cupboard is shown, back of which a comparatively large space is left, which is marked "waste pipes." Proper construction would economize space now devoted to waste pipes, and thereby afford a deeper cupboard.

Figs. 6, 7, 8 and 9 are engraved from plans submitted by "T Square" (No. 101). This set of plans evinces much careful thought and came very near obtaining a place among the selected ten. The embarrassment in which the designer finds himself in the matter of his stairways was deemed sufficient to reject this plan in favor of others. Slight modifications in this point, which our practical readers will readily discover, will make this plan a very desirable one, and as such we commend it to their attention.

Figs. 10 and 11 represent plans submitted by "Echo" (No. 119), which have some features about them to commend them for use, and which, in other respects, are sadly deficient. This designer, in attempting to supply what in some sections of the country there is a popular demand for, namely, a bedroom on the lower floor, and at the same time to keep within the limits of the competition, has got himself into an unfortunate difficulty with the outer corner of his bathroom. We say an unfortunate difficulty, not in the sense that the construction necessary to carry out this design is impossible, but that it is hardly ex-



Figs. 5 and 6.—First and Second Floor Plans, Submitted by "Plane Guide" (No. 133).—Scale 1-16 Inch to the Foot.

pedient for use where better could be suggested. Obtaining the bedroom on the lower floor at the sacrifice of symmetry in the second story, in additiou to the features of construction just meutioned, seems too great a price to pay for it. Another objection which might be urged in this case is the lack of communication with the bedroom on the lower floor except through the sitting-room. A bedroom on the first floor is a great convenience iu case of sickness, but in such cases it is very desirable that some other communication should be had with it except through the principal living room of the house. Perhaps our practical readers will have comments and suggestions to make concerning these plaus.

We have only space remaining for some running remarks on sets of plans not published. "Richard Chenevix" (No. 123) submitted a plan, the most striking feature iu which, in both first and second stories, was a hall modeled after a carpenter's square. It was in two parts running at right angles to each other, the principal part corresponding to the blade of the squaro being wide and the other part corresponding to thc tongue being narrow. The service between the dining-room and kitchen was across an open hall, and in many respects there was a lack of home-like convenience and compactness, which is so desirable in houses of this general description.

Many otherwise good plans in this competition were defective in the matter of communication from kitchen to hall, from kitchen to diniug-room and in other features of this kind. Many were also defective on the score of liberality in arraugement. A number of the designers evidently did not study the position of the lot on which the house was to be placed. Several plans located the dining-room on the north side with windows only to the north.

A few plans were well worthy of admittance to the selected number except for some glaring defects.. Thus the plan submitted by "Cintus" (No. 9) was charming in its arrangement, all the rooms being well placed, and the front hall and staircase being especially elegant. The placing of the water-closet, lavatory and coat-closet upon the best corner of the house, together with crowded and uarrow doors provided for entrance to the lavatory and closets, and the carelessness in the plan manifested in the matter of supports for partitions in the cellar, lost it the place to which it was otherwise entitled.

Another fine design was submitted under the motto of "Paul Kieff" (No. 115), in which the rooms were well arranged, the front hall fine and well lighted. A liberal staircase was placed in the side hall in full view from the maiu hall. As no back stairs were provided, the necessary use of the main staircase for general housework was enough to place it lower than the carefully studied other parts described.

The design by "Comfort"* (No. 169) was defective in placing the dining-room on the northwest corner, while the kitchen was upon the southwest and upon the side street. This same mistake was made by a number of other designers. This design also had the defect of a discrepancy in the matter of chimney betweeu the two floor plans. Such blunders have no excuse. Another design, "Patience"* (168), did not show the kitchen chimney in the second story at all. Had it been carried up it would have passed in front of a window.

Some plans which excited merriment in the minds of the committees who examined them were also received. For instance, those submitted by "Piney Woods" (No. 153) displayed a kitchen 17 x 17 feet in general size, in which were distributed a large fire-place and eleven doors and windows. "Caballo" (No. 84) exhibited a house of four rooms on the first floor, with five chimneys. "Eureka" (No. 180) showed an outside door to every room on the lower floor.

We will close our remarks on this competition for the present occasion by a list of the authors of designs, which, in the estimation of the committees, are worthy of honorable mention:

* Several plans were submitted under the same *nom de plume* by different designers. The accompanying numbers indicate the order in which the plans reached this office, and therefore are given to identify them.

HONORABLE MENTION IN THE FIFTH COMPETITION.

No. 2. Philo S. Ashton, Utica, N. Y.
No. 4. E. W. Campagna, Randolph, Mass.
No. 7. P. Schall, 37½ High street, Columbus, Ohio.
No. 17. J. D. Sibley, Middletowu, Conn.
No. 22. Fred B. Shelton, Chicago, Ill.
No. 24. Ezra M. Cornell, Denver, Col.
No. 26. Geo. O. Woodcock, Claremont, N. H.
No. 32. A. J. Cox, Madison, Ind.
No. 33. Henry Chase, Avou, N. J.
No. 37. Wm. M. Butterfield, Room 49, Opera Block, Manchester, N. H.
No. 40. D. S. Hopkins, Grand Rapids, Mich.

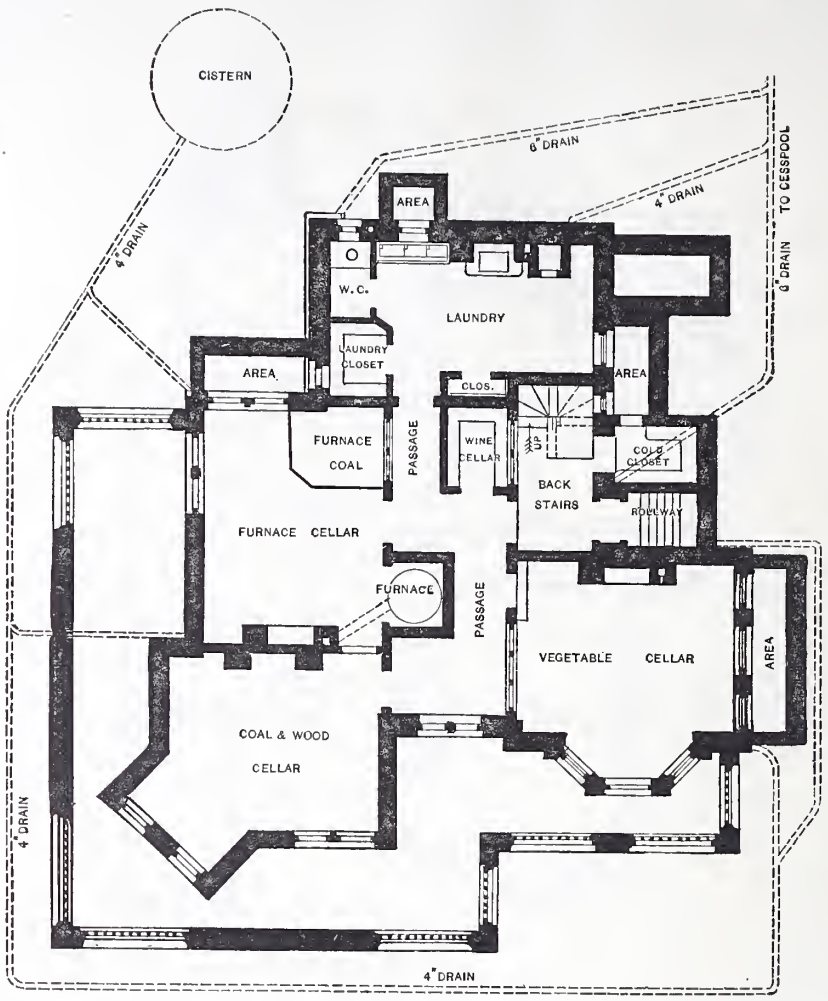


Fig. 7.—Foundation Plan by "T-Square," (No. 101).—Scale, 1-16 Inch to the Foot.

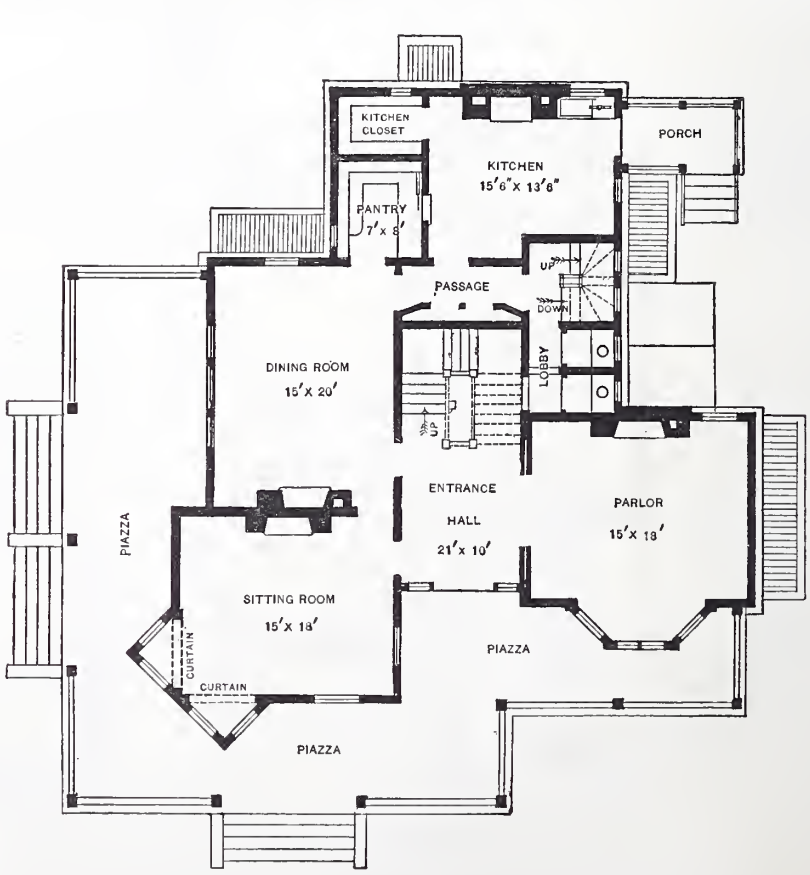


Fig. 8.—First Floor Plan by "T-Square."—Scale, 1-16 Inch to the Foot.

No. 44. Silas W. Smith, Durango, Col.
No. 46. C. G. Maybury & Son, Winona, Minn.
No. 48. Arthur Ginnini, s. w. cor. Fourth and Walnut streets, Cincinnati, Ohio.
No. 50. A. H. Beers, 68 West Liberty street, Bridgeport, Conn.
No. 51. P. Bergen Marryatt, Awagansett, N. Y.
No. 86. Edw. Etzensperger, Cleveland, O.
No. 90. G. W. Bower, Chatham, Morris Co., N. J.
No. 92. E. Burke, 15 Toronto street, Toronto, Canada.
No. 94. H. H. Duker, 202 Bolton street, Baltimore, Md.
No. 95. Wm. R. Gibb, Room 29, Howland Block, Chicago, Ill.

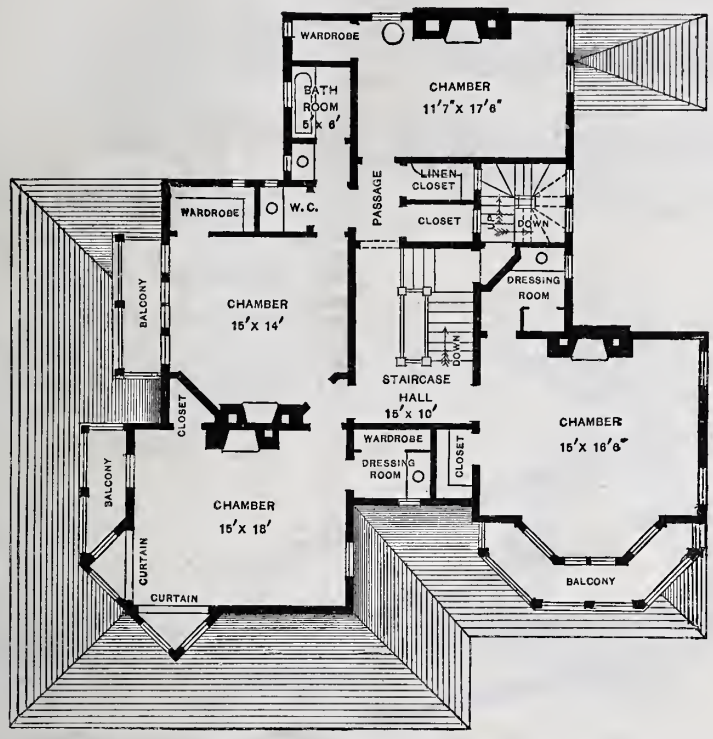
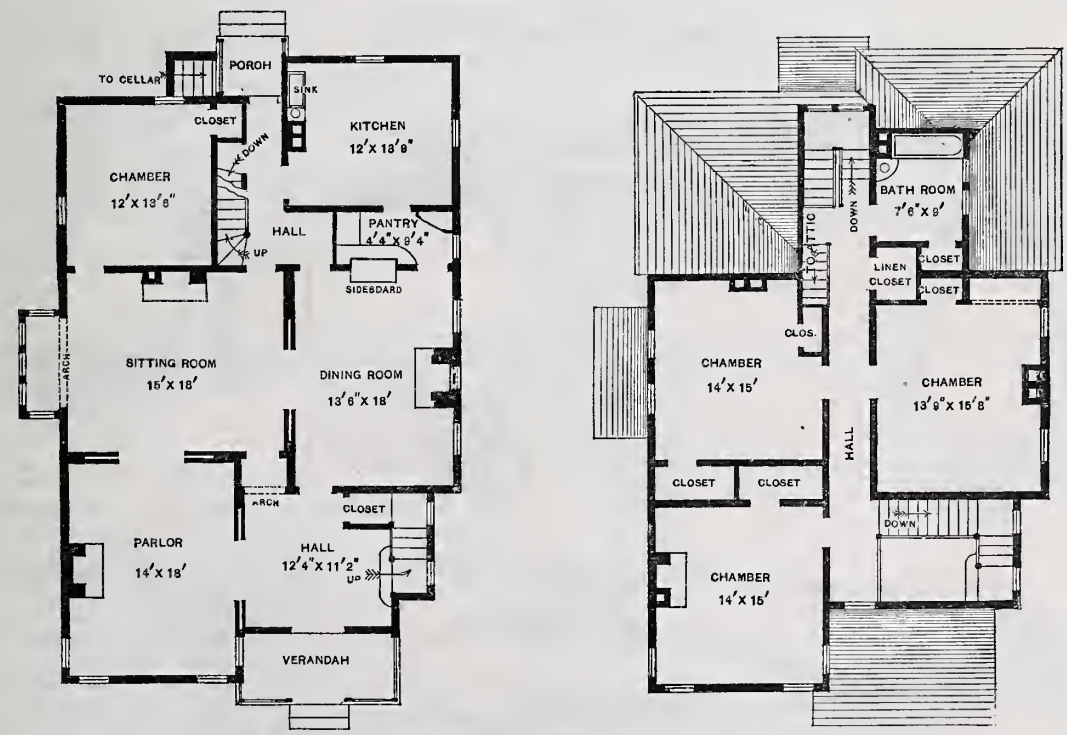


Fig. 9.—Second Floor Plan, by "T-Square."—Scale, 1-16 Inch to the Foot.

No. 57. Arthur G. Young, 15 West Federal street, Youngstown, Ohio.
No. 67. S. N. Small, 48 Canal street, Boston, Mass.
No. 68. Moore & McCoy, North street, Danville, Ills.
No. 70. Cicero Hine, Ottawa, Ontario, Can.
No. 71. Emil G. Rueckert, 599 Main street, Cincinnati, Ohio.
No. 96. Morris W. Smith, 56 Wall street, New York City.
No. 98. J. A. Olds, Duluth, Minn.
No. 100. W. C. Plass, Glasco, Ulster Co., N. Y.
No. 101. Chas. A. Dean, Roslindale, Mass.
No. 102. Austin W. Lord, Winona, Minn.
No. 116. Henry F. Kilburn, 229 Broadway, New York City.
No. 130. Albert H. Humes, Central Falls, R. I.
No. 131. Fred. G. Cooper, 170 Oak street, New Haven, Conn.
No. 134. Joseph Lambert, 5 Ducan street, Boston, Mass.
No. 140. A. S. Josselyn, Cedar Rapids, Iowa.
No. 144. W. Howard Walker, 27 Custom House street, Providence, R. I.
No. 145. Daniel Appleton, 10 Pemberton Square, Boston, Mass.
No. 150. G. N. Miller, Bloomington, Ill.
No. 159. Edw. J. Koch, Pfister's Block, Milwaukee, Wis.
No. 163. Aug. V. Wiskocil, 528 Wells street, Milwaukee, Wis.
No. 167. Geo. F. Newton, 394 Franklyn street, Buffalo, N. Y.
No. 168. Arthur L. Valk, 229 Broadway, New York City.
No. 174. Louis Wangelin, 83 Allent street, Cleveland, Ohio.
No. 175. Wm. P. Anderson, 419 Besserer street, Ottawa, Canada.
No. 177. C. E. Eaton, Gouverneur, N. Y.
No. 179. F. A. Hale, Denver, Col.
No. 182. Edw. D. Fiske, 30 Rochester Savings Bank Building, Rochester, N. Y.
No. 184. H. B. Ingraham, 36 Laurence street, Providence, R. I.
No. 188. Lambert Packard, St. Johnsbury, Vt.
No. 189. Gage Inslee, Stamford, Conn.
No. 193. R. H. Bschaidner, 769 Eighth avenue, N. Y. City.
No. 195. Elliot J. Bassett, 144 Remsen street, Brooklyn, N. Y.
No. 197. David S. Lawson, Hammonton, Atlantic Co., N. J.
No. 198. Wm. C. Hough, 450 Henry street, Brooklyn, N. Y.
No. 200. James G. Thorp, 145 Broadway, New York City.
No. 202. Wm. S. Knowles, Orange, N. J.
No. 210. William D. Dennis, Salem, Mass.

A CORRESPONDENT writing from Greenville, Miss., says: "This is a live town with a population of 3500 to 4000. If the water goes down in the next thirty days there will be plenty of buildings and repairs."

A NUMBER of prominent buildings will be completed in Baltimore during the present season, among which may be mentioned the Chamber of Commerce, the Baltimore and Ohio Railroad office, and the Strowbridge M. E. Church. Two additional buildings, in connection with the Johns Hopkins Hospital, will be commenced shortly.

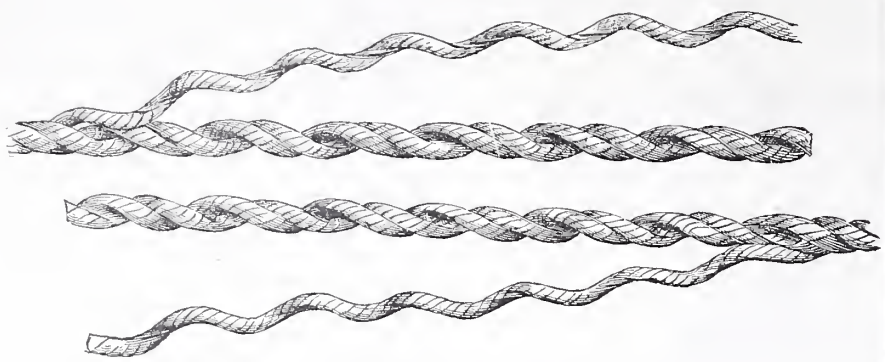


Figs. 10 and 11.—First and Second Floors, by "Echo" (No. 119).—Scale, 1-16 Inch to the Foot.

No. 72. E. S. Payson, 735 Walnut street, Philadelphia, Pa.
No. 74. C. H. Rau, 30 Rochester Savings Bank Building, Rochester, N. Y.
No. 75. E. L. Angell, Bridgeport, Conn.
No. 83. F. B. White, Princeton, N. J.
No. 85. H. James, Ottawa, Canada.
No. 117. Fred. W. Merriam, Shelburne Falls, Mass.
No. 119. J. W. Hammond, Frankfort, Indiana.
No. 121. Herman J Esser, Madison, Wis.
No. 126. John W. H. Watts, Ottawa, Can.
No. 128. H. B. Washburn, Brewer, Maine.

Hemlock.

When hemlock comes into competition with pine it has to take a subordinate place, but alongside of the other soft woods it bears comparison favorably. It is being used more than formerly, and serves excellently for bill timber, plank and rough boards. It is being utilized to a greater extent in Michigan than formerly, and in New Brunswick lumbermen are beginning to appreciate its value. An operator at St. Stephen, N. B., recently stated that last season he received $5000 stumpage for the bark on 2,000,000 feet, board measure, of hemlock logs. One of the principal builders of Fredericktown, N. B., talks thus about the usefulness of hemlock as wood: "For common kitchen furniture, I believe that the best of hemlock might be used very advantageously indeed. I think it is the best soft wood we have for that purpose, pine of course excepted. It does not warp or shrink as much as spruce, and is much easier worked. I have never made any coarse furniture from it as yet, but I am sure it might be used to a considerable extent for such purposes. For building it might be used much more than it is. In 1851 I built a brick house in Fredericktown, and put in hemlock for all the flooring joists, and I think there are no better floors in Fredericktown to-day. Hemlock is superior to spruce for rough boarding or for board fencing, as the boards can be got wider than spruce, and do not require so many nails; and they are not so liable to warp as those made of spruce. It dries very fast, and does not shrink quite so much as either spruce or pine. Hemlock might also be used for the inside finishing of houses, and is very pretty wood when well oiled and varnished."



Management and Use of Ropes.—Fig. 36.—Unlaying Strands for a Long Splice.

Danger of Great Fires.—The great fires of Portland, Boston and Chicago, are vividly in the minds of most grown-up men. Thousands of persons to this day feel in their business or business relations the crippling effects of these fires, and their disastrous results may even extend into the next generation. It seems to-day that most people are consoling themselves with the idea that no such disastrous fires can again happen. A careful examination of the conditions prevailing at the time of these fires, and an inspection of several of our largest cities, leads almost inevitably to the conclusion that New York, Brooklyn, Philadelphia and Baltimore must, at some future time, be the scene of conflagrations which will take their places in history beside those of Chicago, Boston and Portland. A high wind in the right direction, a scant supply of water, and sufficient snow upon the ground to make the arrival of the fire department tardy, and we have the conditions for a fire which would soon be beyond the reach of any fire department. Brooklyn has hundreds of acres of wooden houses, with only here and there a structure of brick. Block after block in New York consists of brick shells filled with wooden floors and partitions. However long we may escape the penalties of such construction, retribution must come in the end. Our only hope is that a gradual replacement may be effected soon enough to escape a general conflagration.

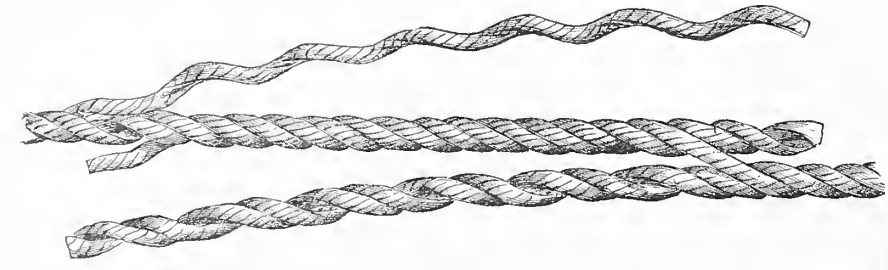


Fig. 37.—Commencing the Splice.

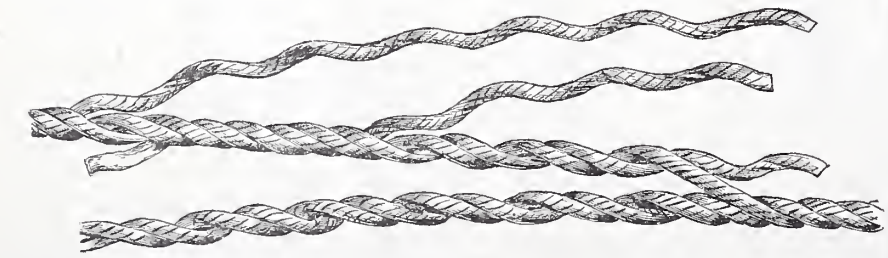


Fig. 38.—Twisting the Strands for a Long Splice.

Management and Use of Ropes.—III.

To make a long splice, bring the ends of the ropes together so that they lap from 18 inches to 2 or 3 feet or more, according to the size of the rope. It is in any case made long enough, so that the ends of the strands from the different portions of the rope do not meet each other. Unlay a strand from each rope as in Fig. 36 for the whole distance which they lap. Then take one of these strands, and twist or lay it in the space vacant in the other rope, as is shown in Fig. 37. If this is carefully done the rope will appear to be untouched. Untwist another strand from the second rope, but only half the distance of the lap (see Fig. 38). Now untwist another strand from the first rope and twist it into the space or score left in the second until it meets the first strand; the rope will then have the appearance shown in Fig. 39. The ends must now be cut out one-half on the under side, and then tied with an overhand knot, as illustrated in Fig. 40. The ends are then stuck each way from the knot, tapering them by cutting out yarns. We believe that on board ship the ends in such cases are stuck only twice. The rope is stretched and a strain put on to see that everything holds fast.

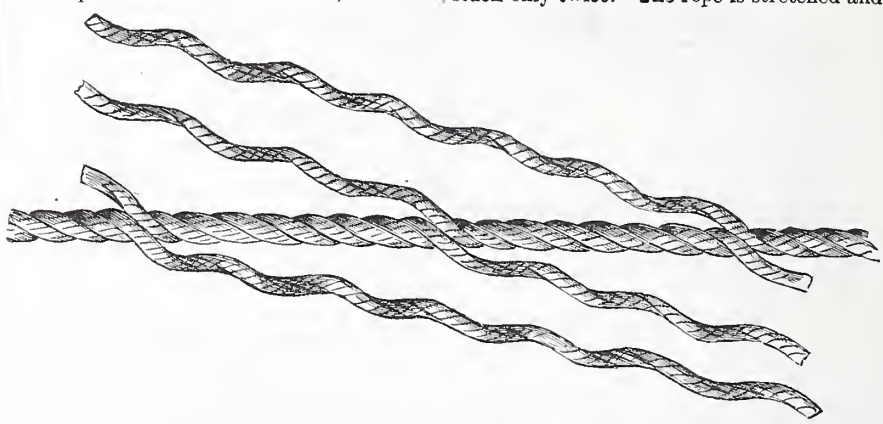


Fig. 39.—Strands for a Long Splice laid up Ready for Tying and Sticking.

The "long splice" is not only as strong as any other portion of a rope, but it can be made so neatly that it does not perceptibly increase the size of the rope, and hence will run through a block without difficulty.

Plenty of grease in the strands and in the splices makes the rope soft and pliable, and at the same time prevents the strands from drawing out as easily as they would do otherwise. After a splice is finished it may be hammered down all round with a mallet, a block of wood, or anything that will not cut the yarns. This consolidates the ropes and reduces the size of the splice to a surprising degree.

One of the most useful things to have in the end of a rope is what is called an eye splice. In this the rope is spliced to itself by a short splice so as to form a ring or eye. While it takes only a few moments to make, it is strong and easily loosened. In Figs. 41, 42 and 43, the first three steps of the eye splice are shown. One strand now remains to be disposed of. How this is done is seen in Fig. 44, which shows the eye turned over and the strand stuck. The splice is then finished by sticking the ends once more and then tapering them, or by sticking them without tapering; in either case the operation is the same as for an ordinary splice. Fig. 46 shows how to begin an eye splice in a four-stranded rope. It is finished like any other eye splice.

Fig. 40.—Tying the Strands of a Long Splice in an Overhand Knot.

When a strong knot for joining rope is wanted without regard to the size, and

when only a short length is available for making the joint, a "shroud knot" is valuable. It is composed of two wall knots similar to those shown in Fig. 21 in our second article, through which the strands of the opposite rope are passed. This knot is counted as strong as the rope itself. If the ends are tapered and then the whole tightly whipped

Fig. 41.—First Step in an Eye Splice in a Three Stranded Rope.

or "served" for their whole length, a very neat job is the result.

In practicing it is well to take a tarred rope of about ¾ inch in diameter, as the strands are larger and more manageable and a better idea of the relations of the strands in a knot or splice can be obtained from it.

NOTES AND COMMENTS.

THE FREQUENT OCCURRENCE of disastrous fires keeps the public constantly excited as to the safety of the buildings in which large crowds are wont to assemble. With all that has been done in the way of extra exits and precautions against fire under regulations

Fig. 42.—Second Step.

recently enforced, it is to be doubted whether any of the popular theaters in this city could burn during the hours of a performance without great loss of life. Many of the churches in this city are also veritable fire traps, owing to the narrow passages leading out of the buildings, not to speak of the crooked stairways from the galleries. There is, happily, less chance of a fire in a church than in a place of amusement, but still, churches have burned, and, at times, lives have been lost. In a recent interview, the venerable Peter Cooper, expressing himself upon this subject and with reference to public halls, strongly advised building them in the basements of buildings rather than in the upper stories. The large hall in Cooper Union, as is well known, is in the basement. The special advantages of this plan are that people, in going out, climb up stairs instead of passing down them, which prevents choking of passages and tramping to death in the case of a panic. This hall is also well provided with exits, there being seven in all, and although it seats about twice as many persons as some of the largest churches in this city, it is emptied at the close of a lecture in a remarkably short space of time. Commenting upon this same subject, the Chairman of the Liverpool Watch Committee recently said that the only public building in America perfectly safe against fire is the Mormon Temple at Salt Lake City. This is an extreme view to take, but, nevertheless, the example cited is one that deserves to be considered. The Mormon Temple is an edifice capable of holding 13,000 persons. Doors are placed on all sides of the building, so that it can be emptied in three or four minutes. The Coliseum, at Rome, has also been referred to as affording ample means of exit

Fig. 43.—Third Step.

for the enormous multitudes that congregated in it, and being, therefore, superior to modern buildings. Without venturing to hope that in Christendom we shall altogether equal the practical wisdom of the Latter Day Saints or the pagans of ancient Rome, something surely can be done to improve the construction and planning of theaters, music halls, and the like, to prevent their being mere death traps whenever the cry of fire is raised.

COMMENTING UPON the recent fire in the Potter building in this city, Mr. Mullett, at one time architect for the Government, makes, in effect, the following statement: That if it were possible to construct every building in a city of incombustible materials, like the New York Post Office, the result

Fig. 44.—The Eye Turned, showing Disposition of Third Strand.

would be a fire-proof city. This statement has such a plausible sound that it has almost always been accepted as truth wherever it has been made; and yet it is fallacious. The belief in this idea of incombustible buildings has done much to retard the introduction of fire-proof construction. Incombustible buildings may easily be destroyed by fire where their contents are of a combustible character. Incombustibility is not necessarily fire-proofing. A building of wood can be made fire-proof, yet it is certainly of a combustible material. On the other hand, a building entirely of iron may be destroyed by fire. If architects in general would turn their attention to rational fire-proof construction, the art of fire-proofing would make very material progress. At present penurious owners will not incur the expense of the so-called fire-proof buildings, save in exceptional cases.

IN FIRE ESCAPES we need those which can be handled from the ground and capable of reaching persons at least 75 feet from the

Fig. 45.—Finishing the Eye.

ground. It is, of course, out of the question at the present time to think of building fire-escapes by which people can be rescued in the tops of our highest buildings. A 75-foot escape, however, would be able to reach the tops of all the more dangerous wooden buildings of New York. Without such escapes future fires will doubtless show equally heavy losses of life. In large buildings of this character, it is quite out of the question to depend upon escapes which shall be fixtures upon the building itself. When fire is dangerously rapid in its course it is impossible for occupants of the same floor even to pass from room to room. It is equally impossible to provide fire escapes applicable to every

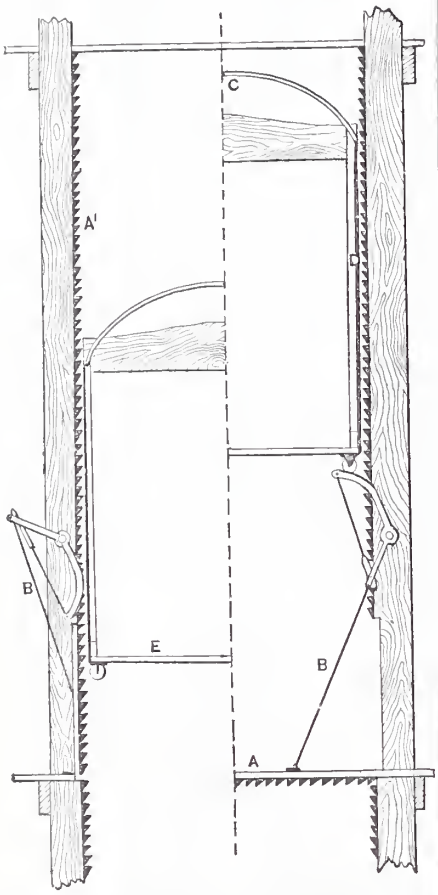
Fig. 46.—Commencing an Eye Splice in a Four Stranded Rope.

window or even every room. The mechanical question involved in the construction of such an apparatus is not an easy one. We think that to be successful it must be large, self-propelled, and when in position worked by steam. It must be of the most powerful character, for in our large cities one of its most serious obtacles to contend with will be a network of telegraph wires. Preparations would have to be made for the breaking or cutting of these. To be of service this work must be done with great rapidity.

FOR THE FIRST time in the history of the stage a theater was lighted throughout by electricity during the last week of Decem-

ber. The auditorium of the Savoy Theater, in London, has been illuminated by the electric light from its opening, but at the date named the electric rays were used exclusively in the building, including the stage. The lights employed were the incandescent lamps invented by Mr. Swan, Newcastle-on-Tyne. Those who witnessed the experiment report it a complete success. Between the first and second acts Mr. D'Oyly Carte came before the curtain and briefly explained the special advantages of the electric light, more particularly showing its great safety in regard to fire. Another advantage attendant upon its use is the fact that the upper galleries in the theater were as cool as the lower ones, the oppressive heat generated by the gas burners being absent.

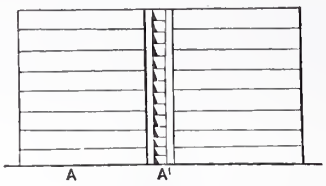
THE BUILDERS' EXCHANGE, of Cincinnati, is now entering upon the fifth year of its existence. The organization embraces persons connected with the various branches of the building business, and undoubtedly renders excellent service to the building interests of the city. The Exchange allows its members the use of a large room, centrally located and comfortably furnished, and provided with a telephone and with all the conveniences of a down-town



Automatic Hatchway Doors.—Fig. 1.—The Cage, shown in Two Different Positions with Relation to the Doors.

office. Every member is entitled to a numbered letter box, to which he can have all business or personal communications directed. Files of all the principal American and European journals devoted to building and mechanical interests, are kept for consultation. The most important, however, of all the advantages presented is the assemblage at the Exchange of members of every branch of business for consultation for the sub-letting of contracts and the mutual interchange of views. The dues are $10 per annum and the members are guaranteed against any further assessment.

AT A RECENT MEETING of the Polytechnic Association of the American Institute, Mr. S. K. Devereux, of New Brunswick, N. J., explained his new art, called "kopto-graphy," recently patented. Cherry, or other tolerably hard wood, is treated on the surface with any suitable filler, and smoothly finished. It is then stained in some dark color. Suitable designs are drawn or stenciled upon the surface, the portion of the surface representing the designs being afterward sunk by a rough-pointed instrument, worked by hand with a hammer or by any suitable machinery. The figured portion, with a part of the adjacent plain surface, is then treated successively with shellac and gold size. All which lies on the plain surface is wiped off. When the size is sufficiently dried, gold-leaf is applied. The gold-leaf is retained on the sized surfaces only, and is protected by its sunk condition from any wear in wiping or otherwise treating the work. By this means very handsome orna-



Automatic Hatchway Doors.—Fig. 2.—The Door A of Fig. 1.

mentation may be produced, and we understand the invention is being tested both in railway cars and on pianos. As a specimen of what may be done by this method, we would mention that a picture of the landing of the pilgrims is being prepared, to occupy a panel 6½ by 6 feet, to be used in the decoration of the steamer "Pilgrim," now being built at Chester.

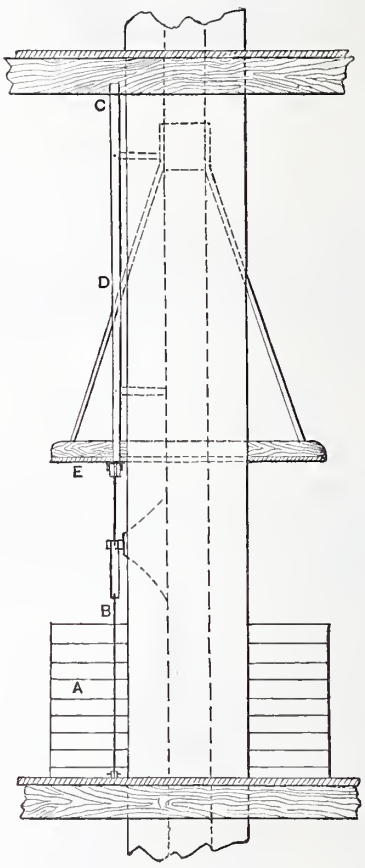
ONE OF THE MOST beautiful processes of wood ornamentation, recently introduced in some of the foreign establishments, is thus carried on: A veneer of the same wood as that which the design in question consists of, is glued entirely over the surface of any hard wood, such as walnut, and allowed to dry thoroughly. The design is then cut out of a zinc plate about one-twentieth of an inch in thickness, and placed upon the veneer; the whole is now subjected to the action of steam, and made to travel between two powerful cast-iron rollers of 8 inches diameter by 2 feet long, two above and two below, which may be brought within any distance of each other by means of screws. The enormous pressure to which the zinc plate is subjected forces it completely into the solid wood beneath it, while the zinc curls up out of the matrix it has formed, and comes away easily. All that now remains to be done is to plane down the veneer left untouched by the zinc, until a thin shaving is taken off the portion forced into the walnut, when, the surface being perfectly smooth, the operation is complete.

CO-OPERATION IN HOUSEKEEPING is not an untried scheme. The principles have been applied in a more or less perfect manner at several different places. The Summit Park Residence Co., of Cincinnati, are undertaking a new enterprise in this direction. Twenty houses are to be built, with a club-house and dining-hall. A very fine piece of ground has been selected, and plans and estimates have been prepared by Mr. S. Hanaford, the well-known architect of that city. Each house is 24 feet wide, 40 feet deep, and situated so as to be 100 feet from each of the two avenues upon which the plot of ground fronts. This will give two large parks of trees and lawn to be laid out with carriage-ways, walks, &c. The dwellings will contain six large rooms with closets, trunk-room, bathroom, halls, &c. The club-house will contain a kitchen, with servants' room, a dining-hall of ample size, so that each family will have its own table, a club-room and a ladies' assembly room, which will be used as a reading-room and for receptions, parties and the like. This building will also contain boilers for heating purposes. Communication will be had from the several dwellings with the dining-hall by passage-ways or porches, arranged with windows so as to be closed and heated during cold weather. It is proposed that the caterer in charge of the club-house will furnish meals either at the dining-hall or at the residences, as may be desired. He will have entire charge of the several dwellings, and also of the lawns, walks and the like.

NOVELTIES.

AUTOMATIC HATCHWAY DOORS.

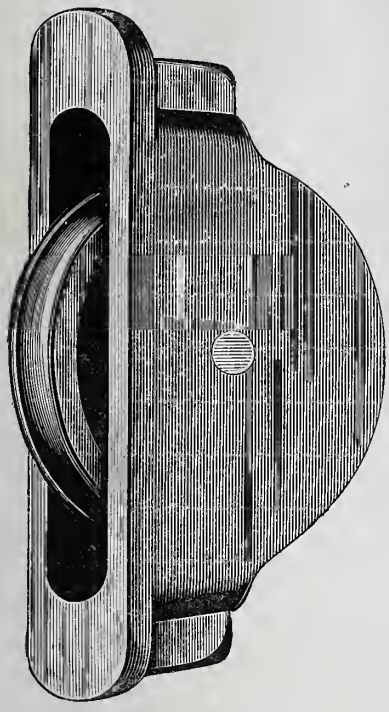
Some of the most destructive fires which have happened within the last ten years may be traced to a combination of unfavorable circumstances. The most dangerous of these circumstances or conditions have usually been open elevator shafts, which, acting like chimney flues, have carried the fire from story to story, and at the same time acted as enormous blowers. A few years ago we had an example of this action in the destruction of the famous Appleton Buildings on Bond street in this city. Well-secured doors prevented the firemen from gaining access to the building, while the large elevator shaft, extending through some six or seven stories, fanned the flames at the base and carried them with extreme rapidity to every floor in the building. Similar conditions were found in the Potter (*World*) building, recently destroyed. The safe and sensible plan, where elevators are employed, is to have the openings in each floor always closed, except at the time when the elevator platform or cage is passing. Our



Automatic Hatchway Doors.—Fig. 3.—Side View of the Apparatus.

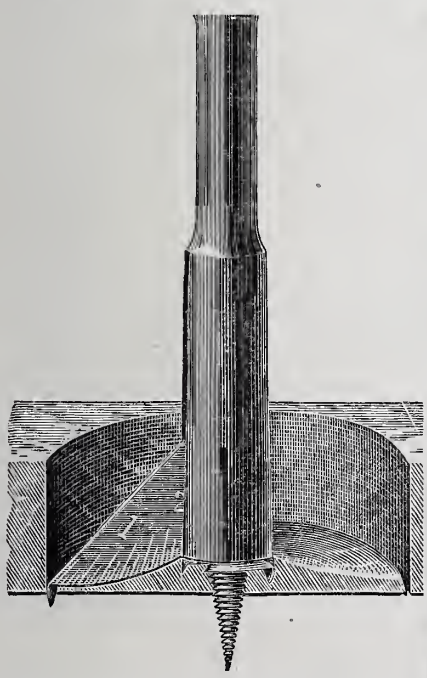
illustrations represent a set of automatic hatch doors, made by Messrs. Clem & Morse, 413 Cherry street, Philadelphia, Pa. These doors open as the cage or platform approaches them, remain open until it has passed them, and then close. Fig. 1 shows the elevator cage in two different positions with relation to the door. On the left-hand side the cage E is shown with the door up and open. On the right-hand side the cage has risen above the door and its guard, and the opening is represented as closed. On the bottom of the platform a roller is placed which, striking against a projecting arm, depresses it, and at the same time lifts the door A by means of the connecting rod B. This door carries upon its under side guides and the teeth for the safety cages. Fig. 2 shows the door A by itself, A^1 being the guides and the teeth. Fig. 3 is a side view of the whole apparatus. C is a bow above the cages which lifts the door, and D is a guide against which the levers rest when holding the door open. The two arms of these levers are connected by a rod which is slotted, so that the positions of the two guides can be regulated. This is necessary, because the wood shrinks and warps to a greater or less extent, and if there was no possibility of adjustment

it would be very difficult to keep the parts always in proper relation to each other. By means of an improvement now being patented, the manufacturers are able to make their doors in such shape that the lines of both guides and teeth are made continuous when the door is open. This is important, for if special arrangements are not made to



The Screwless Window Pulley.

secure this an awkward break is left at the bottom of the door, into which the guide-rolls frequently drop and catch. This catching sometimes has caused accidents of a pretty serious nature. These doors can be applied to any elevator-shaft and in factories especially are a great convenience, as well as a means of safety against fire. They work



The Derby Expansion Bit.—Fig. 1.—General View of the Tool in Boring Through a Board, the Spur Cutting through the Bottom.

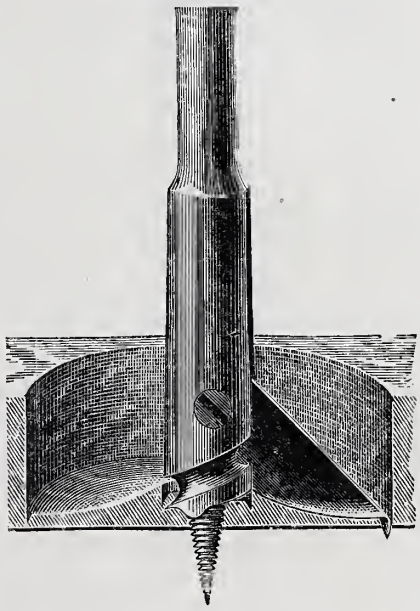
noislessly and without any attention. By their use the unsightly, inconvenient and often stifling elevator shaft is made unnecessary. In crowded factories, when light is scarce, this is often a very valuable point.

THE SCREWLESS WINDOW PULLEY.

The Clark Manufacturing Co., Buffalo, N. Y., are introducing a hardware novelty in the shape of a window pulley requiring no screws or nails. Many inventions have hitherto been employed to fasten sash pulleys in place without screws or nails, but they have not been generally successful. The makers of the device shown in the accompanying illustration claim to have accomplished this perfectly, as the pulley is not only secure in place without screws or nails, but it is said to present a much more finished appearance when inserted than if held in place by any visible means of attachment. The mortise is made by hand, or with a machine to fit the pulley case proper, and the pulley inserted either end up. The end wing or flanges are driven into the solid wood attached to the end of the mortise. If applied to hard wood, a small kerf is made to receive the flanges. This pulley is of great importance to manufacturers of window frames, as it effects an important saving both in screws and labor. It is coming into quite general use and is well spoken of by consumers.

THE DERBY EXPANSION BIT.

All users of boring tools will be interested in what is called the "Derby" bit, now being put upon the market by the Derby Bit Co., of Ansonia, Conn., the general features of which are clearly shown in the accompany-



The Derby Expansion Bit.—Fig. 2.—The same with the Segmental Lip in the Opposite Position.

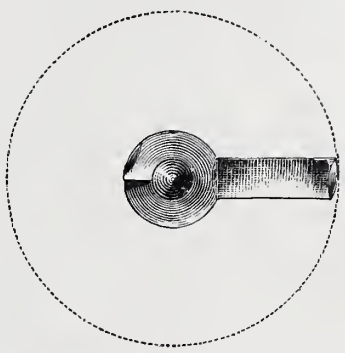
ing illustrations. The special advantages which this tool possesses, and to which the manufacturers direct particular attention, are positive action, ready adjustability and simplicity of parts. The segmental lip, two views of which are afforded in Fig. 4, slides into a slot in the side of the shank, an indication of which may be noticed in both Figs. 1 and 2. This is held in place by means of a single screw. One side of the lip is graduated so as to make it readily adjustable for various diameter of holes. The bit is calculated to cut from ¾ inch to 2 inches in diameter. By examination of Figs. 1 and 2, it will be seen that the segmental lip with its spur cuts slightly in advance of the spur upon the shank. The effect of this is to leave sufficient thickness of wood in the bottom of the hole at its center to carry the bit until the spur upon the segmental cutter shall have cut through, thus preventing splintering on the under side. Fig. 2 represents the segmental lip at one portion of the revolution, while Fig. 1 shows it after it has advanced a half revolution. Fig. 3 represents a bottom view of the tool as it would appear in use. The cuts represent the instrument full size.

THE ONLY public buildings at present in progress in Cincinnati, are the Custom House and Post Office. At present the iron rafters and trusses for the mansard roof are being erected. New city buildings for the city officials have been in contemplation for a number of years. At present no definite prospect seems to exist for their erection.

Practical Stair Building.—XIX.

A SIMPLE FLIGHT OF STAIRS.

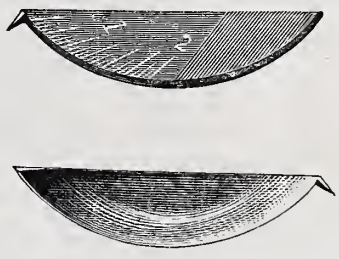
In our last paper we stated that attention would next be given to some of the working problems which are ordinarily used in every-day practice, and which would practically illustrate the application of the principles to a consideration of which our papers have so far been devoted. The accompanying engraving shows the plan of a straight flight of stairs connecting at a platform with another straight flight leading to the floor above. The outside line in the engraving represents the face of the wall string. The line on the inside of the stairs represents the center of the rail. To avoid having a confusion of



The Derby Expansion Bit.—Fig. 3.—Bottom View of the Tool.

lines, the face of the front stringer is not represented. Referring to the reference letter, I is the center of the newel at the face of the first riser. To draw the miter for the rail and at the newel cap, proceed as follows: With a radius equal to the width of the rail, take I A, equal to one-half the radius of the cap. From A draw the miter lines as shown.

To draw the pattern of the easement of the rail proceed as follows: Toward the left draw an elevation of the treads and risers as indicated in the engraving. Mark C, the short baluster, about one inch back from the face of the second riser. Mark *b*, the long baluster, one-half the width of a tread from C. Transfer C to the elevation by the dotted lines C *c*. Through *c* draw the rake line *c b* on the pitch of the stairs. Draw *b b*. From the point *b* in the rake line draw the level line *b i*. Draw A *a*, thus determining the end of the easement. At *a* and *c* make the width of the pattern equal to the thickness of the rail. From the leading points thus obtained



The Derby Expansion Bit.—Fig. 4.—Face and Back View of the Lip.

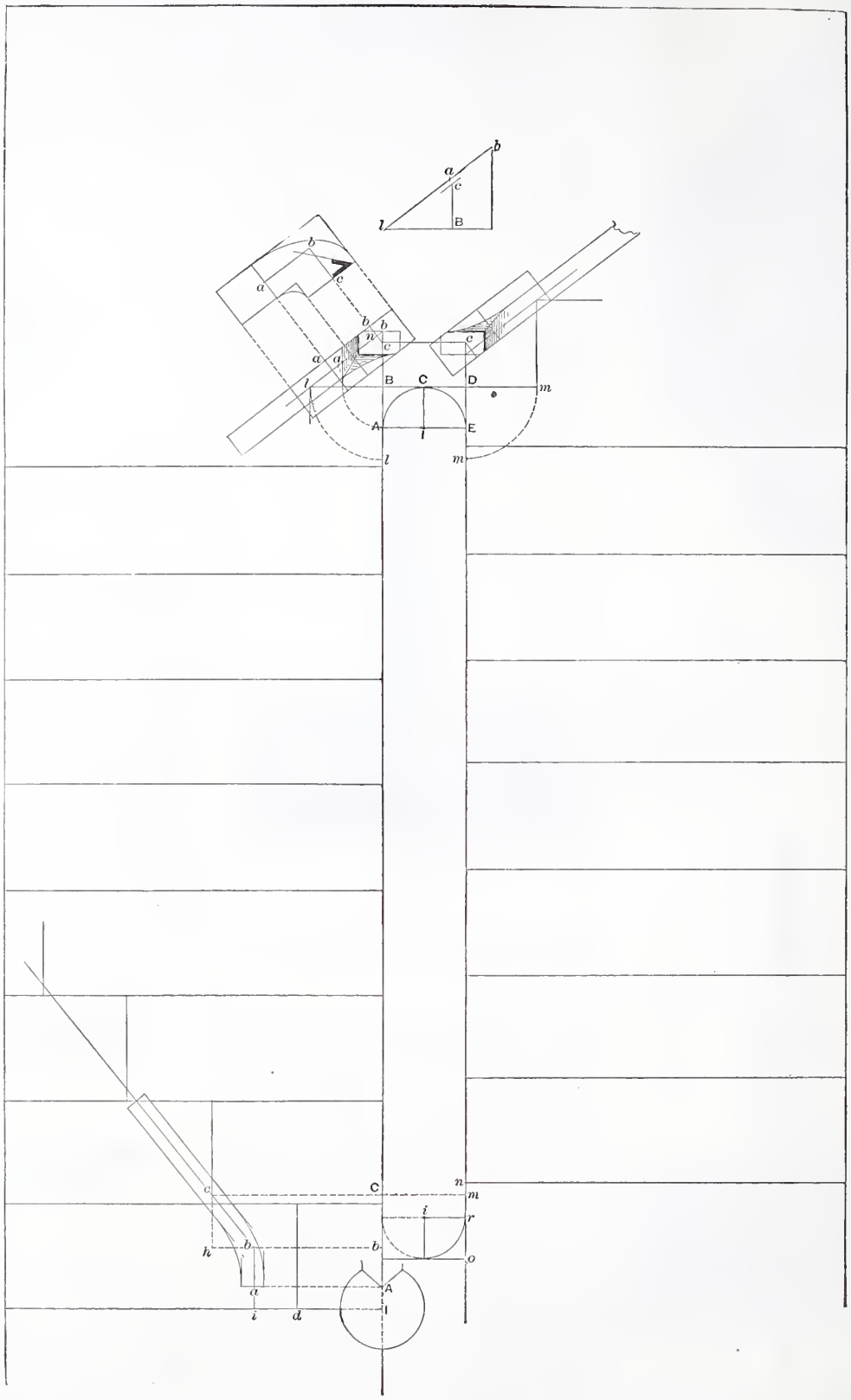
and as shown in the engraving, draw the curve lines of the pattern.

When a rail of ordinary thickness is employed the balusters are usually run to the center of the rail. The hight of the newel post above the first step is usually the same as the hight of a long baluster, except that part of the baluster which enters the rail. When the newel is set at the end of a level landing, the hight of the post above the floor is made to correspond with the long balusters. When the newel post is set back even with the nosing of the first step in order to make room at the foot of the stairs, the post must be set higher than a long baluster in order to produce a suitable easement of the rail. In such cases there is not room for a long baluster on the first step. When the newel is placed as shown in the engraving or in order to get a longer curve in the easement, or for some other reason the newel is made higher above

the first step than the long baluster, the long baluster for the first step must be of extra length in order to reach the rail.

The diagrams at the platform in the engraving show the plan of the twists which connect the straight flight below with the straight flight above. The triangle shown in this portion of the illustration is the pitch-board of the stairs, showing the width of a tread and the hight of a riser. In drawing the elevation for a rail it is usual to go by the short balusters, without paying any attention to the risers. Thus in the engraving the line *l m* is the stretchout of the lines B *l*, B D and D *m*. The two twist pieces required in this construction of rail are both alike and are interchangeable. At the joint C the center of the rail is taken at the center of the plank, but at the ends which join the straight rail, the spare wood is all cut away from one side of the plank.

The rule for obtaining the face pattern for the twists here required is the same as explained in our ninth article, contained in the May issue for last year. In the engraving, *a b* is the rake line over A B; *b c* is made equal to B C. The level at *c* is the angle at B on the pitch-board. Some straight wood is added below *a* for convenience in holding the piece in the vise.



Practical Stair Building.—The Easements and Twists in a Flight of Stairs Having an Intermediate Platform.

In this drawing the position of the short balusters, and consequently the position of the risers, is determined as follows: Draw B *c* equal to one half a riser. Around the point *c*, as a center, draw the inclined rectangle, which represents the end of the rail block before the spare wood is cut away. Make the distance *b m* equal to one-half the thickness of the rail, and through *n* draw the rake line of the straight rail, meeting *m l*, the line of the landing, at *l*. Then *l* is the place of the short baluster. Draw the arc *l l*, and at the proper distance in front of *l* draw the face line of the landing riser. Place *m*, the first short baluster on the second flight, opposite to L. At the proper distance from *m* draw the first riser line of the second flight.

To determine the distance B *l* and D *m* without making this drawing, take the difference between one-half the thickness of the rail and one-half the thickness of the plank—that is, the distance *n c* as it appears in the drawing—and at this distance from the hypothenuse side of the pitch-board, draw a parallel line, as shown in the engraving. Draw the perpendicular B *c* equal to one-half a riser. Then B *l* in the pitch-board, is the distance required. When the cylinder is small and the face line of the riser is placed at the spring of the circle, that is, at A and E, the elevated tangent line over B D would be on a pitch, and therefore the pattern for the

twist would be drawn as explained in our sixteenth paper, page 228 of the December number for last year, or as shown in our thirteenth paper, page 172 of the September number for the same year.

If a cylinder is placed at the head of the second flight, the distance *m o* should be the same as *l* B at the head of the first flight. When any straight flight of stairs begins from a cylinder, the starting riser should be located near enough to the beam so that the foot of the timbers underneath the stairs can have a firm hold upon the beam. If the landing runs along straight with the line *m o*, then a ramp similar to the lower easement can be used to connect the rake rail on the stairs with the level rail on the landing. The short baluster is shown by *m*. The dotted line *m c* shows the corresponding point *c* on the easement. The hight *h b* being one-half the rise, brings the line *b a* just right for the long balusters on the landing.

Prospects of the Building Business.

Last year the building interests enjoyed unusual prosperity. From Maine to California, and from the extreme North to the extreme South, mechanics were busily employed, and more building was done probably than in any other one year in the history of the country. After a season of prosperity of this kind, the question is of unusual interest. What is to be the measure of the building business for the present year? In an effort to answer this question, we have obtained reports from nearly one thousand different points, and upon the information thus obtained we base a few general remarks. The inquiries which we addressed to our correspondents referred to wages for stonemasons, bricklayers, carpenters, painters and plasterers, with respect to rates paid last year, the rates demanded now, and how wages are likely to rule during the season, whether higher or lower than at present demanded. With respect to employment, we inquired what proportion of the mechanics among the building trades were employed last year, what part of them are at present employed, and what proportion it was expected would have steady employment during the approaching season. With reference to new work, we inquired as to the prospect at the present time, as to the character of the new work, whether it would be repairs and additions, or new buildings, how this outlook compares with the same one a year ago, and whether it was anticipated that the building business in each of the communities would be more or less active the present season than last. We also inquired as to the causes which have led to the present condition of the building business in each of the several communities. If space permitted we might present very interesting tabulated statements, showing graphically the condition of the building trades in various sections of the country. This, however, is impossible, and therefore we must content ourselves with such general conclusions as are possible in the form of an article.

The larger cities naturally come in for prominent attention in a report of this kind, and yet, in all probability, there is less interest attaching to the building operations in them than in the smaller towns throughout the country. Commencing with our seaboard cities, Boston reports wages among the five trades enumerated as about the same that ruled at the close of last season. Higher wages are anticipated when the building season fairly opens. Nearly all of the mechanics in the building trades are at present busy, and the demand, when the season fairly opens, will probably be greater than the present supply.

In New York, Brooklyn and other cities in the immediate neighborhood of the metropolis, substantially the same conditions exist. Wages have an upward tendency. Successive advances were made in the building trades during the last season, until the prices demanded by mechanics have become somewhat excessive in the estimation of property owners. A number of large enterprises, notably that of the Metropolitan Opera House, have been either abandoned or postponed on account of the increased cost of building ensuing from this state of affairs. There does not seem to be any likelihood, however, of the building business being dull during the coming season in this vicinity. The prospects are that enough improvements will be carried through to give employment to all the mechanics in the community. There is danger, however, in case wages are carried to a much higher point, of checking building enterprise to an appreciable extent.

Our report from Philadelphia quotes wages on an average twenty-five cents per day higher than the general average of last season, with a prospect of still further advance before the season is over. Mechanics are quite generally employed at the present time, and there is but little doubt that all will have remunerative employment throughout the season. In Baltimore the same conditions prevail. Wages are quoted from twenty-five to fifty cents per day higher than last year, with a prospect of still further advance before the season is over, with all the mechanics at present employed, and the prospect of their having steady work through the season.

Of the prominent inland cities, Pittsburgh expects to pay the same wages through the building season as are at present demanded. These are reported as $3.50 per day for masons, $5 per day for bricklayers, $2.75 per day for carpenters, and $3 per day for painters and plasterers. These figures represent an advance of nearly 10 per cent. on last year's rates. A great deal of new work is in prospect, and nearly all of the mechanics are at present employed. In Cleveland the rates are higher for masons and carpenters, but lower for bricklayers, than just quoted, and at the present time rule very nearly the same as during last season. Higher rates are anticipated before the present season is over. An immense amount of new building is prospected, and mechanics are fully employed at the present time. Wages in Cincinnati rule about the same as in Cleveland, with the exception of the rates paid bricklayers, which are about $4.50 per day. The outlook there at the present time is much better than it was a year ago. Mechanics are at present very generally employed, with the prospect of all having work throughout the season at fair rates. Other prominent towns in Ohio, Dayton, Columbus and Toledo also show favorable prospects.

In Buffalo, N. Y., wages at the present time rule as follows: Masons, $3; bricklayers, $3; carpenters, $2; painters, $2; plasterers, $3.25. These are substantially the same rates as prevailed last year, but our correspondent says there is a prospect of higher rates before the season is over. More buildings are prospected at the present time than one year ago. About the same rates prevail in Detroit, with an abundance of work in prospect. A busy season is anticipated in Chicago. Omaha, which had an active building business last year, will probably find employment for all its mechanics during the present season. Louisville, Ky., reports a better prospect at the present time than existed a year ago at this season, nearly all of the mechanics of that place are at present actively employed. Wages are expected to rule about the same as during last year. Wages are reported in St. Louis the same as prevailed during last year, with the exception of the painters, who are obtaining about 50 cents per day more. All the mechanics are at present employed, and the prospects for steady work are very good. It is anticipated that higher wages may be demanded before the season is over. In New Orleans the rates of wages are the same as prevailed during last year. No special advance is anticipated during the present season. All the mechanics it that city are at present employed and will probably have steady employment during the year. Our correspondent anticipates a more active building business the present year than during last season. In San Francisco and other cities of the Pacific Coast, the building business was active during the latter part of last season, and is brisk at the present time. A very considerable number of costly buildings are in progress at San Francisco. Mechanics are very generally employed, with indications that all will have work during the year. In Sacramento wages are reported somewhat lower than ruled last year. No change is anticipated during the season.

Of twenty-three prominent cities from which we have reports, thirteen report the prospect of wages to be an advance upon those obtained last season, nine report the rates likely to be the same as obtained last season, while only one indicates a lowering of prices, and even there our correspondent states that there is a better prospect of work at the present time than there was in the same place a year ago. With reference to the question of wages for the future, it may be proper to remark in this connection that it is possible correspondents in some instances are influenced in a measure by their own desires. It should be remembered also that it is yet early in the season and that there are many causes which may change the building prospects before the season is fairly opened. These points should be borne in mind by all who base any action on the figures here presented.

Referring now to the country at large, our reports from the extreme Eastern States indicate that building prospects are most excellent throughout that region. From every point in Maine from which we have advices the report is that every mechanic will have employment during the season. About two-thirds of our correspondents report that the prospect is that more work will be done the present year than last year. Several of them emphasize by saying "very much more work." None of them anticipate less to be done than a year ago. The same general conditions are reported in New Hampshire and Vermont. Both repairs and new work are anticipated in abundance. In Connecticut there does not seem to be the same anticipation of prosperity. Several points report less business in prospect than a year ago and give as a reason advance in wages and higher prices of building material. On the other hand, several of the manufacturing towns report more work in anticipation on account of the general prosperity of the manufacturing industries. Only one town out of all those from which we have reports indicates lower wages. The rates demanded in it are at present from twenty-five to fifty cents per day higher than those which ruled a year ago. This town anticipates a larger building business than during last season, and the lower wages in prospect are probably only a restoration to what are considered fair rates. Mechanics are very generally employed throughout the state, and, with the exception of one town, employment is anticipated for all during the year.

We have a very complete report from Massachusetts, and in no town from which we have heard is there admitted to be a prospect of less work than last year. More than half of the places anticipate a larger building business than a year ago, and the remainder of them a trade fully equal to that of last year. Without an exception, our correspondents estimate that every mechanic in their neighborhoods will have employment. From about one-half of the towns an increase in wages over the rates paid at the close of last season is anticipated, while in the remainder the same rates as paid last year are expected to rule during this season. The conditions in Rhode Island are substantially the same as those of the States immediately adjacent. The general expectation of work is quite as good as last year, and wages are anticipated to rule the same or at a slight advance.

The diversified interest of the State of New York makes it a representative State. We have a very complete report from all sections. In answer to our question, "Do you expect the building business in your community to be more or less active this season than last," the answer is almost uniformly "more." Only five towns from which we have heard anticipate less trade than last year. Only four believe it will be about the same as last year. All the others anticipate at the present time a larger trade than ever before. That the building of railroads, even in the Empire State, stimulates building enterprise, is manifested by our reports from this State. Quite a number of towns report increased building due to the opening up of new roads. A number explain the bettered prospects on the basis of general

prosperity. A few refer to large fires which have prevailed in their towns within the last few months. Good crops and prosperity among the farmers is also quite generally referred to. From what has already appeared, it may be anticipated that all of the mechanics throughout the State have fair prospects of being fully employed during the season. More than half of the towns from which we have heard anticipate an increase in wages. None of the others expect wages to be any lower than they ruled last year.

The Keystone State is, perhaps, not less representative than New York, and our report from it is not very unlike that just presented. From a very complete showing from towns located in Pennsylvania, it appears that geueral prosperity is in anticipation for the building interests throughout that state. Nearly all the mechanics are reported as at present employed, and it is believed none will go idle during the summer. Wages are anticipated to rule no less than last year, while over one-half of the towns from which we have heard reports expected advances. Some of the reasons given for the better prospects of building by our correspondents are very much to the point. For instance, one of them says, "that the larger business is due to the increased demand for houses."

New Jersey seems to share the general prosperity of the larger states. Mechanics are fully employed, and wages are likely to rule fully up to those obtained last year.

Following down the coast, Delaware, Maryland aud the District of Columbia, all report flattering prospects, with mechanics very generally employed aud no prospect of idleness through the season. Wages throughout this district are expected to rule about the same as last year. Throughout Virginia and West Virginia the prospects are likewise good. From all the points in Virginia from which we have heard, with one exceptiou, wages are expected to rule the same as during last year. In the town referred to building is expected to be much more lively than a year ago and wages, consequeutly, are anticipated to advance. About one-half the towns in West Virginia anticipate rates same as last year and the other half a slight advance. Mechanics throughout both of these States arc mostly employed at present.

The same general condition of prosperity seems to extend through both of the Carolinas, Georgia and Alabama. With scarcely an exception through the first three States mentioned, our correspondents report an increase in business prospects for the present year. Wages in North Carolina, South Carolina and Georgia, are expected to rule about the same as a year ago, although several towns report an anticipated advance. The building business in Florida is largely affected by the demand for summer hotels and resideuces in the popular places of resort situated through various sections of that State. Wages have never reached the same figure there as in some of the Northern States, and, accordingly, the anticipated advance which our correspondents report this year will not appear unreasonable. Business is reported active at Tallahassee, at Jacksonville, and at points along the St. John's River.

The disastrous floods with which the Mississippi Valley has been recently visited will no doubt have a material effect npon the building business in certain sections of Louisianna, Mississippi and Arkansas. The general outlook in Mississippi, as reported by our correspondents, is not favorable. The inundation of the country is mentioned by them. Only a portion of the mechanics throughout that State are employed, and there are at present no indications that the entire number will have steady work through the summer. In Louisianna the conditions are very much the same. In neither of these States are higher wages mentioned by any correspondent, and a number of them seem to think that lower rates than last year will prevail this season. Fort Smith, Arkansas, is the only point from which we have heard in that State that reports higher rates in anticipation. All the mechanics aro employed there at preseut, and indications for trade are favorable.

Tho general outlook through Texas is not as favorable as in many other sections of the country. Nearly one-half of the reports which we have received from that State indicate prospects of less business this year than last. A few report a larger trade in anticipation, while some expect about the same. Wages are likely to rule about the same as last year. A few places report higher wages in anticipation, while others report lower.

In pleasing contrast with the somewhat gloomy outlook throughout the lower Mississippi States, Ohio, to which we shall next give atteution, reports an active building business at this season throughout the State, with better prospects ahead. The almost unanimous opinion of our correspondents seems to be that wages will rule higher than last year. Only four towns from which we have heard report that less than the eutire quota of mechanics found employment last season. Even these expect that all will be employed during the present season. Both repairs and new work are reported from all points. The reasons stated by our correspondents for the anticipated building activity are various. New manufacturing enterprises, low rates of interest, good crops, new railroads, prosperity among the farmers, and other similar reasons are mentioued.

Indiana and Illinois present equally flattering prospects. About one-half of the correspondents from whom we have advices in these two States, anticipate higher rates of wages before the season is over. Present rates, in many cases, are an advance on those paid last year, while in no instances of any importance are they lower than last year. Much more work is in anticipation now than a year ago at this season. Mechanics are very generally employed at present and the prospects are that the amount of building done will be limited entirely by the ability of contractors to fill their engagements.

Throughout Kentucky there seems to be a fair prospect of a good building season. Tennessee, on the other hand, does not present so favorable a report. More business is anticipated in Nashville than a year ago at the present time, while in Knoxville the prospects are about the same.

The general outlook in Michigan is quite favorable. Only two towns from which we have reports anticipate less business than a year ago, three towns about the same as a year ago, and the balance of them more than last season. Wages are likely to rule about the same this year as last year, though a number of our correspondents report the prospect of an advance. The mechanics of Wisconsin are anticipating a fair share of prosperity. Nearly all are reported as at present employed, and the general outlook of work is said to be better than a year since. Our correspondent from Madison reports wages higher at the present time than ruling rates during last year, with a prospect of still further advance.

Our correspondent in Minneapolis, in answer to our question, "What is the prospect for new work?" replies "Splendid." This seems to be the keynote of all the reports from Minnesota. A very prosperous building year is there anticipated. Wages are likely to rule about the same as last year, or at a slight advance. Iowa reports that all her mechanics were employed last year, that nearly all are at work even as early in the season as the present time, and that all are likely to have employment throughout the season. Wages at present rule somewhat higher than a year ago, taking the state on a general average, and the prospects in some of the more important towns are that still further advance will be made. The general outlook, according to our correspondent's report, is quite favorable.

Missouri does not present quite so favorable an outlook as the other Western states. The failure of crops in several instances is the explanation offered for less building in prospect at the present time than a year ago. Wages are reported as likely to rule during the season as at present, while the present rates are in most cases the same as prevailed a year ago. Only three or four of the more important towns anticipate an advance on last year's rates. From the reports at hand, we would suppose that throughout Missouri there will be an average building business done this year, and that it is poor only in contrast with the States that are doing so much more than usual.

Immediately west, in Kansas, better conditions seem to prevail. Our correspondents there report quite as much business in anticipation for this year as was done last year. Wages in the more prominent towns are likely to rule higher than a year ago. All the mechanics seem sure of steady work throughout the season.

Fair prospects seem to exist throughout Nebraska, although our correspondents are not so enthusiastic as from some of the other States. We have but meager reports from the extreme West, on account of the short time allowed our correspondents in which to send in their returns. From the few reports that have reached us from Colorado, it appears that the prospects are quite as good at the present time throughout that State as a year ago. In about three-fourths of the places from which we have reports the prospects of wages for the season are higher than the rates which prevailed last year. In Dakota Territory the prospects seem to be decidedly more favorable than a year since. A brisk business is anticipated in all the towns, without exception, from which we have heard. In Arizona and Montana a fair business is anticipated. Very meager reports from Utah lead us to believe it will do its fair share of building during the season. Fair activity seems likely to prevail throughout California.

Summing up the reports from our correspondents, and considering the country as a whole, it would seem that the prospects at the present time indicate that a more active building season is just before us than has ever been experienced in the history of this country. While we seem fully warranted in making this assertion upon the reports from our correspondents, we are fully aware that in almost all cases more buildings are prospected in the early days of the spring than are actually erected during the season. Especially is this the case in the small towns. Making all due allowances for this we still believe that if no unforeseen disaster overtakes the country, the building business for 1882 is likely to be quite as active as during the year 1881. Should our country be blessed with good crops this year, and should the condition of our finances remain favorable, there seems to be no doubt but that the era of prosperity so auspiciously commenced a short time since will continue for a considerable period into the future.

We would not be doing this subject full justice if we concluded this report without a word of caution to those mechanics who are living in expectation of a considerable increase in rates over those at present paid. The reason of the present building activity throughout the country is that prices of materials and labor are such that improvements are profitable. Investment in buildings is justified. Any considerable advance in prices will check building operations. As appears in the above summary, this feeling is already manifested in New York City, and we know of some other sections of the country where it prevails. While we are disposed to favor the highest prices for labor that are in reason, we would caution the mechanics of the country against excessive demands which, if pressed, might have the effect of killing the goose that lays the golden egg.

LUMINOUS PAINT seems to be one of those interesting substances apparently possessing a wide range of valuable qualities, and yet it seems difficult to find uses to which it may be put. The match safe is better for a coat, aud the photographer, in certain kind of work, is able to use it to advantage. Clock dials are visible at night when painted with it, and a number of similar uses can be mentioned, yet the really valuable properties do not appear to have been exhausted nor put to any very great utility. No doubt this substance will improve upon further experiment.

THE RESULTS EXPERIENCED with various forms of so-called "fire-proof" buildings is thus summed up by the *American Architect and Building News:* "Structures consisting of a granite shell, inclosing naked iron beams carrying brick arches and supported by unprotected cast-iron columns, in point of security against fire are little better than frames of timber and plank, aud far inferior to timber frames covered with wire cloth and plastered."

CORRESPONDENCE.

We take this occasion to return thanks to the very large number of our subscribers who have assisted us in the way of reports concerning building prospects in their several neighborhoods, upon which our article on building operations in another column has been based. The relationship existing between this journal and its subscribers is of the most intimate and confidential character. We never yet have appealed to our readers in any matter in which they did not respond promptly and satisfactorily. In assisting the Editor in matters of this kind, they also serve themselves, and while acknowledging our obligations to our readers for information received, we are disposed at the same time to congratulate them upon their willingness to put forth the effort from time to time that is necessary to make the paper a real help to themselves. Our correspondence department, which is always crowded, and which always contains interesting matter, is a standing example of this sort. Our "Stray Chips" department, which is gradually becoming more and more important, is another evidence of the co-operation of our readers. The items which we publish in it from month to month are in almost all instances original with us, coming directly from local correspondents.

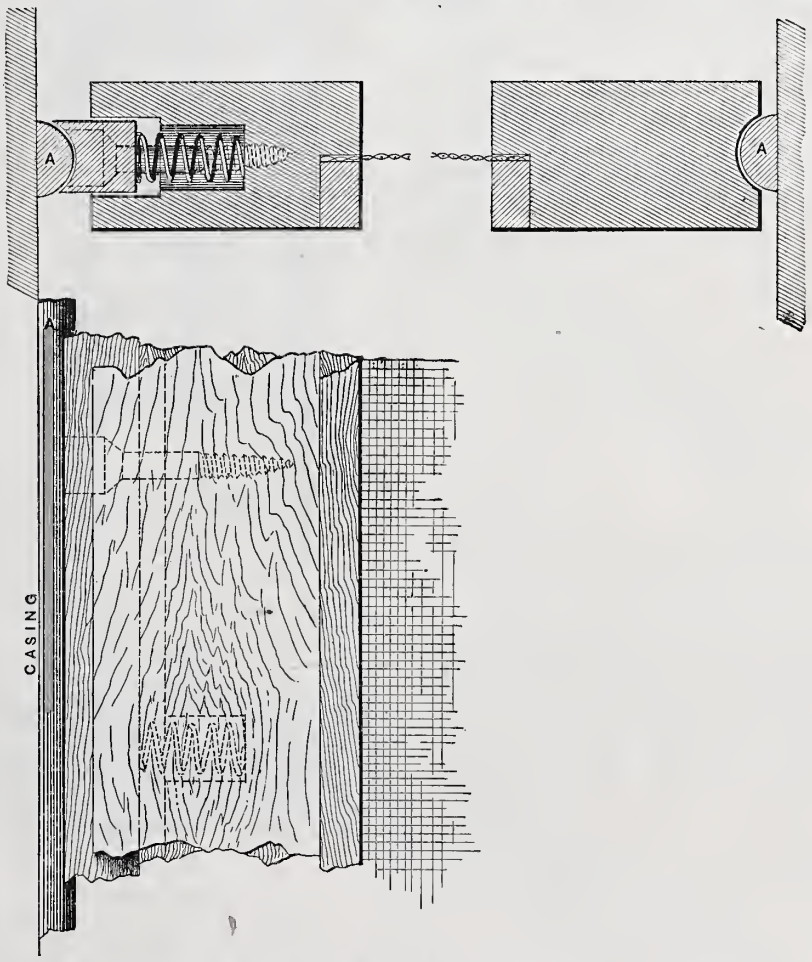
Strength of Floors.

From ANDREW DOREMUS, *Paterson, N. J.*—Me and the jur wot wurks on the uther sied of mi bench hev tuk ure paipir sumtiem. He cum in tuther mornen his faze longir'n a dominy's wen taklen a bole of church fare oistur soop. I axed him ef twuz wurmz, or gripes, or meesels, or chickin pocks, or luv. He sed he wuz thinken. I luked at him, he'd nevir thot befour to mi nollege. I axed him shud I git a doctur. He sed sumthin about a fule an sum uther wurd I didn't ketch on 2. Sais he I've bin redin. Sais I wot, an he shode me C. L. Gs desier—I red it suner'n skat. Sez I we ar praktikle fellars, 2 of uz; let's git on thiz, az he ukers up a practikle cwescion in the rite shaip, yu git sum stun an a platfurm skail to wa the stun and I'll borrur the lumbur. Then we'l bild C. L. G.s problum an jist se how much the durn thing wil saiffly hole. He went fer the stun an things, wile I went to se the lumbur—an a man. I seed the man with the yuzuul rezultz, wich wood hev bin bettir in 2 tiems fur the saim lode. At enny rait I disreckulected the sieses of the lumbur on the drawens. I got the paipir agen, an I'm blesid ef I cud tel wot kine of stuf wuz ment, ef the 6x8 timber wuz pien, oke, hemlok, spruse or paloo, or wich of them the beemes wuz to be. I red moar: poasts sit in the groun, an wich wuz 4ft6. Then the cwescion wuz, weathir the hoal poast wuz 4ft6, or ef it wuz 4ft6 in the groun, or 4ft6 owt of the groun. Then I se nuthur man thru a thic bottum tumblur, 'n I red moar. thare wuz a dubbl floar, he didn't sa how thic the louer thicnes wuz 2 be, nor hou thic the top wuz, or wot kine of stuf, ef 1 or boath, or wich was lade diagnly, or ef 1 or wich, or boath or ethir wuz lade on the kontinuus girddur prinsipul or hou. The jur cums in now, an axed weathur I'd the stuf. I axed him wot kine of stuf it wuz bit he paipur—He poot on hiz glasces, an purseedid to rede the arkitul vary cairfuly: then he sed that enne boddy wot cuddent understan that arkitul, must be an wuz a nateral boarn—(this wuz vary profain). Then I notisid he'd sean sevirle men. We sot on the bensch with mi han undur hiz chin, an 1 of hiz feat in mi provindur reseptickle, wile we discused an cussed the cwescion, til we desidid C. L. G's spessifikashuns wear N. G. Thuz wuz lost to the wurld a gran egsibitshun ov aplide siense; thuz wuz lost a thurrilee, praktikle, test of the saif wate C L G's beemes an floar an poasts wud saiffly sustane; lost an opertuneti 2 maik an undowted, unbowndid, suksesful eggsperimint, absoloot becaws praktikle, praktikle becaws the eggsperimenturs knu no sciens, korrect becaws eggsperimintle, praktikle becaws the 2 ov uz nevir red a sientifik buk, an becaws we cuddent understan em ef we hed. We don't beleave in sciens, or sientifik buks, or sientifik rools ennywa. We cuddent maik a theoretikle problum as we hev no nolege of that kine or very litle of enny uthur—No uthur partiz wil ever maik the atemp to illusidait this problum so eggshostively, so thurrile, so praktikly, so withowt buks or figgurs or theore as we wuz 2, in our mines. As we talced we wundured wy C. L. G plaised 11, 2x8, 12ft beems on 2, 6x8, 13ft 6 in girddurs, an weathur he diddent hev 2 much beemes for hiz girddurs or 2 litle girddurs for hiz beemes, an wy he cut owt ½ the with of hiz beemes on hiz girddurs; if that wuz the sientifik wa of maiken stronggur beemes, and abowt that 4ft 6 poast and sich, an wear he'd eggspeck we'd git enne theoretikle noledge, and lastlee but not leestlee ma be he diddent meen us ennywa. We wood boath like to heer frum him agen when he hez tiem to be moar eggsplitic, and we hev tiem to maik moar eggsperimints. We eggspeck to be vary bizzy aftur nex weak. I wud hev written yu oftennur last yere, but most of yure problums ware not praktikle enuf fur me to takle. I aint much on siense, or on theoretikle noledge, an I supose sum galute wil sa on enny othur kine.

From R. F. HATFIELD, *New York.*—Your correspondent, C. L. G., in the January number, asks, first, what weight will be safe to put on a floor such as is represented by the sketch he inclosed. In reply, I desire to say that he must give further data, viz.: The kind of wood of which the joists, girders and posts are made, the diameter of posts, and the manner in which they are footed in the ground; whether the girders have a floor on each side of them, and if so, the length of the joists on the side not shown, and, finally, whether the weight to be supported is to be distributed evenly over the whole floor or concentrated in any one point; if the latter, where? All the facts as to what a floor is must be known before it is possible to tell what it will safely carry.

In a work entitled "Transverse Strains,"* by R. G. Hatfield, there may be found a full explanation of the method of computing a safe weight to be carried upon a floor under conditions of this kind. The tables in this book give answers to most of the questions of the above character arising in common practice, by simple inspection, without computation.

From A. F. H., *Bangor, Me.*—I do not exactly like the plan of floor proposed by C. L. G. in the January number. I do not think the sills are strong enough for the floor joists. If he uses good spruce lumber the floor will sustain with safety 80 pounds to a square inch loaded at the center, one foot between bearings, or it will sustain double that amount, 160 pounds, evenly distributed the whole length. The strength of timber is as the square of the depth multiplied by the breadth and divided by the length. The strength of one of the floor joists, which are about 11½ feet between centers, will be $8 \times 8 \times 2 \div 11\frac{1}{2} \times 160 = 1780.8$ pounds; the strength of eleven of them will be 19,588.8 pounds. The strength of the two sills will be $8 \times 8 \times 6 \div 13 \times 160 \times 2 = 9452.3$ pounds, or about one-half the strength of the floor joists. A much stronger and safer floor could be made by putting an extra post under the middle of each sill, and placing the floor joists on top of the sills instead of halving them on. I have found, by taking an average of transverse tests of lumber, that hemlock is about 25 per cent., and white pine 16 per cent., weaker than spruce. Juniper is 18 per cent., and cypress 11 per cent. stronger than spruce.



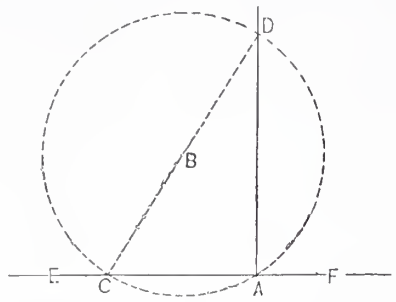
Construction of Window Screens.—Submitted by L. W. A.

Window Screens.

From L. W. A., *Peterboro, N. H.*—I have carefully read the several communications with reference to window screens which have appeared in the past, and as I have a method which I think is superior to any of those published, I have thought perhaps you could make use of still another. The sketches sent herewith represent a full-size horizontal and vertical section through the stiles. It will be noticed that one of the stiles is provided with a ⅜ by ⅜ groove in one edge, with a piece of hard wood just sufficient to fill the groove. A half-round groove is made in the edge of it to fit on to a half-round strip, which is tacked

* "Transverse Strains," by R. G. Hatfield, 630 pages; size, 6 x 9½ inches; illustrated with nearly 150 engravings; substantially bound in cloth. Price, $6.

to the casing. The ⅜-inch hard-wood strip has a spring behind it to press against the strip in the casing in order to hold the second wherever it may be desired. The hard-wood piece is held in place by two screws 3 inches from each end. The hole in the strip is bored out enough to take in the head of the screws. The spring is put about 1 inch inside of the screws, or about 4 inches from the end. The screen may be used

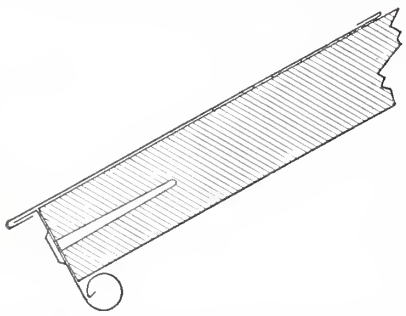


Erecting a Perpendicular by Means of Dividers and Straight Edge.

either inside or outside, as may be desired. If used inside, the half-round strip may be made out of black walnut, which does not require to be painted.

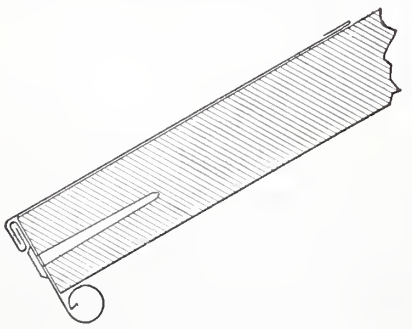
Erecting a Perpendicular by Means of the Dividers and a Straight Edge.

From H. N. S., *Orbisonia, Pa.*—I use the following method for laying off a right angle in all accurate drawings, rather than



Finishing the Edges of Tin Roofs.—Fig. 1.—The Seam Before being Bent Down.

trust the correctness of my T-squares and triangles. Referring to the diagram, let E F be a line on which it is proposed to erect a perpendicular, and A the point at which it is to be erected. With the dividers opened to any width, place one leg at A and the other at any convenient place on the paper, as B. With one leg still at B swing the other around

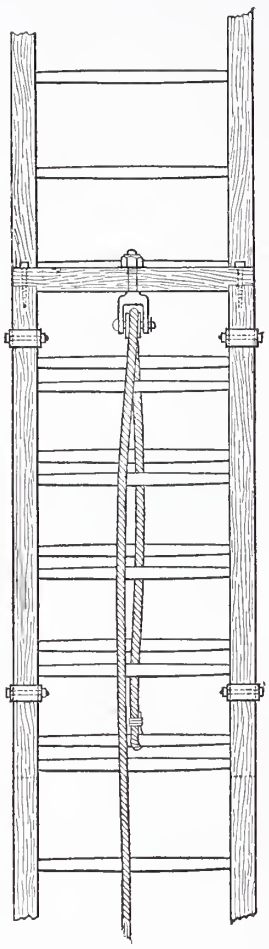


Finishing the Edges of Tin Roofs.—Fig. 2.—The Finished Edge.

until it reaches the point C in the line E F. With the dividers in this position, place the straight-edge against the legs, being careful not to disturb the position of the points. Holding the straight-edge carefully in this position, lift the dividers; place one leg at B and with the other make a mark close to the edge of the straight-edge at D. Then a line drawn from the point D thus established to the point A will be at right angles with the given line E F. In following the above directions some suggestions may be serviceable. When placing the straight-edge against the dividers, lean them a little from the point, that the edge may be brought as close to the points as possible. In marking the point D, care should be taken that it is just the same distance from the edge of the straight-edge. Upon the accuracy with which the operation is performed depends the accuracy of the result.

Finishing the Edges of Tin Roofs.

From A. Northrop & Co., *Pittsburgh, Pa.*—In a recent number of *Carpentry and Building* we noticed a method of finishing the edges of tin roofs suggested by W. K., of Broden, Ohio. The plan proposed is a

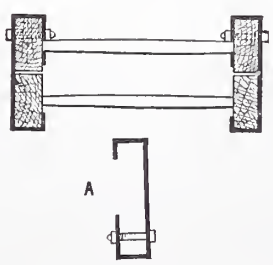


Extension Ladder.—Fig. 1.—Elevation.

very neat one. We think, however, if he would put his seam on the outer edge of the sheeting board instead of on the top it would be an improvement, since it would save the time and expense of soldering an extra seam and cleating the seam also. We inclose sketches showing the suggested improvement. Roofs finished in this manner will be found on buildings in the neighborhood of Elyria, Ohio.

Extension Ladder.

From D. M. W., *Caledonia, Mich.*—I inclose the plan of an extension ladder that I have in use, and which gives good satisfac-

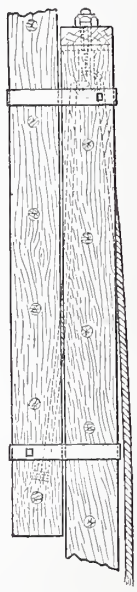


Extension Ladder.—Fig. 2.—Detail of Hook.

tion. The ladder is composed of two sections, each 20 feet long. I can extend it 36 feet, and two men can work on it with perfect safety. The ladder is made of yellow pine scantling, 2 by 4 inches, dressed and sized. There are two hooks fastened on the upper end of the lower section with bolts, and two on the lower end of the upper section. A in Fig. 2 represents the shape of the hook. It is made of wrought iron, 1½ inches wide by 5-16ths inch thick. It is bent so as to form an opening 8½ inches long by 2⅛ inches wide. Fig. 1 represents the ladder ready to slide together. The lower section has a piece of 2 x 4 stuff bolted on the top end of it, as shown in Fig. 3. To this is attached a wrought-iron pulley. A rope is tied to the lower round of the upper section and is passed up through the pulley. By this arrangement a person standing on the ground, by pulling on the rope, can raise the upper section to the required hight. While in this position the rope is carefully tied to a round near the bottom of the lower ladder. Some ladders are provided with rope grips for the purpose of fastening the ropes. I do not consider them safe for the purpose. It is possible that some one may tamper with them while in use, thus causing an accident.

Dutch Ovens.

From E. W. F., *Cottonwood Falls, Kan.*—I have seen ovens built of fire-brick, round in general shape, with arched roof, tight-closing iron door, and without flues. They were heated by building fires in them of fagots or pieces of wood. After a certain time, when the oven became sufficiently hot for baking, the ashes were swept out and the articles to be baked were put in and the door closed. Will you please tell me if you consider such an oven a suitable one for use, and will some of the practical readers of the paper suggest the proper hight and dimen-



Extension Ladder.—Fig. 3.—Details of Ends.

sions for an article of this kind? I do not require a very large oven, but one suitable for family purposes.

Answer.—The kind of oven described by our correspondent is known, in certain sections of the country, as a Dutch oven. They came into use before the era of stoves, and, although the modern apparatus has in part superseded their use, they are still quite popular among many old-fashioned people. Some of the best bread we ever tasted was baked in ovens of this kind, and we know more than one housekeeper who prides herself upon the quality of her baking, and who, although fully competent to manage a modern stove, declares there is no baking like that done in a Dutch oven. This statement in part answers our correspondent's question. The oven is undoubtedly suitable for use and satisfactory in its operation. It is not of a character, however, that is popular at the present day, or what would be provided by most people in connection with their homes. The modern cook-stove has almost entirely superseded it. The same description of oven is used in a great many bakeries, and much of the bread that is made in various sections of the country is baked directly on the hearth of the oven, after the ashes are swept out, without ever so much as a pan being used. This may be proved in some cases by examining the round loaves of bread supplied by bakers, on the bottoms of which will be found traces

of ashes, bits of charcoal, &c. If any of our readers are able to answer our correspondent's question with regard to dimensions, construction, &c., we shall be pleased to have them forward replies for publication.

Problem in Hand Railing.

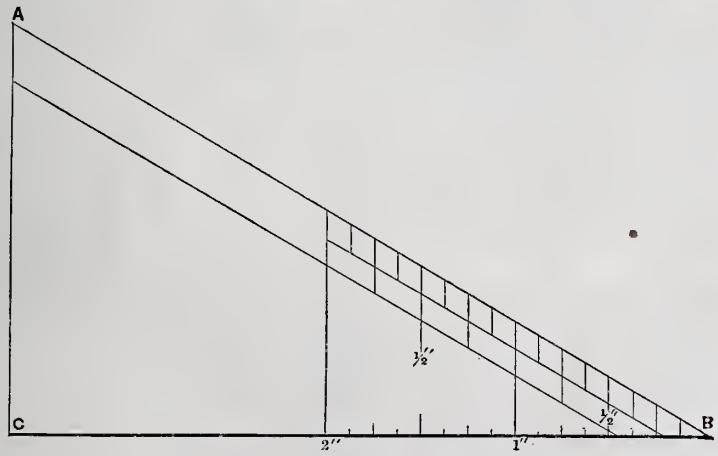
From E. L. G., *Manor, Pa.*—Referring to the problem in hand-railing published on page 39 of the February issue, I desire to inquire if a line from A at right angles to A B, striking the line F C, would not form the base of a triangle, and extending from that point to the line F H, at right angles with F H, form the altitude of the triangle that would furnish the correct bevel for the lower end of the rail, using the altitude and hypothenuse. I also desire to inquire if a line from B at right angles to F C, striking F E, would not form the base of a triangle, and a line from B to the line F H, at right angles to F H, form the altitude of a triangle that would give the correct bevel at the top end of wreath.

Answer.—The first proposition of our correspondent above, as we understand him, is incorrect; the other, as we understand him, is right. In both cases there is an attempt to measure the solid angle by the plane of the plank meeting a vertical plane whose base is F C, the vertex of the angle being at the line F H. The first triangle constructed does not measure it at all, because when put in position it does not form a right-angled triangle, the base line not being drawn at right angles with F C. The second proposition, on the other hand, complies with this requirement, and would, therefore, furnish the angle required for the top end bevel.

Molding Knives.

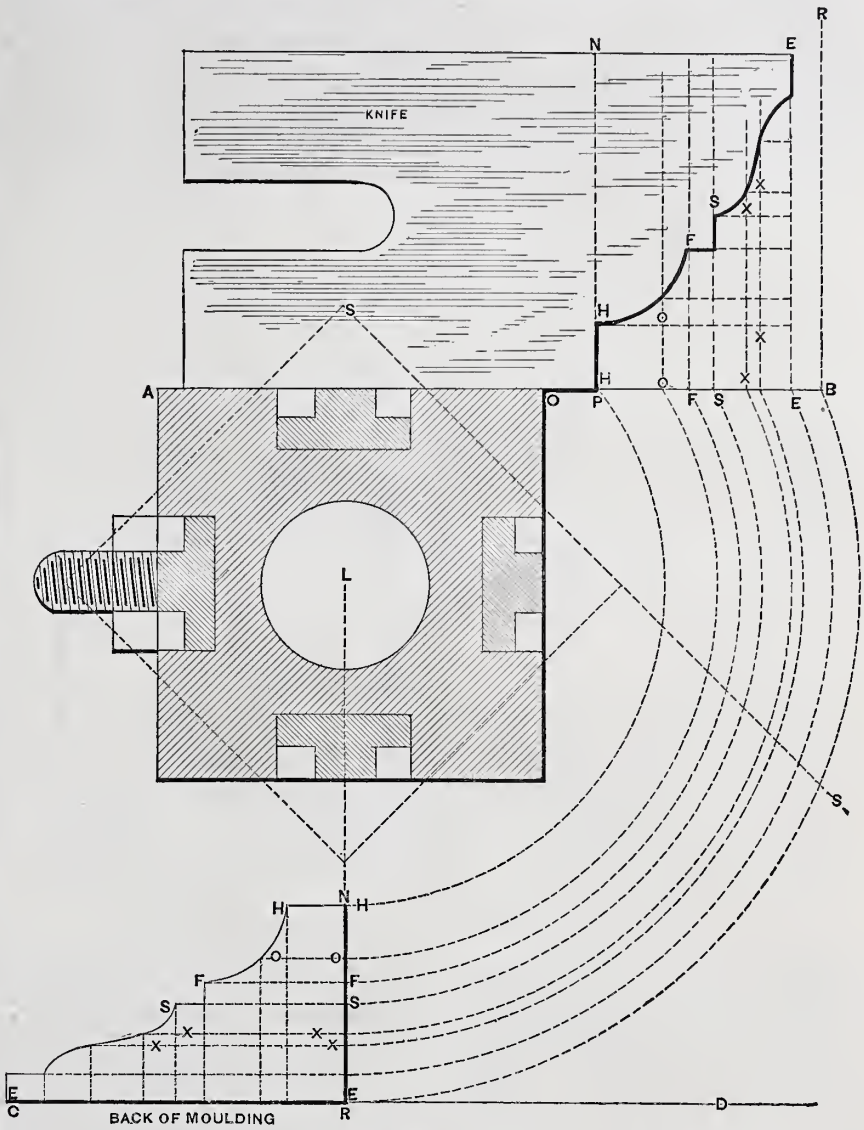
From W. G. O., *Las Vegas, N. M.*—I have waited to see if any one would reply to the question of C. R. P. with reference to molding knives, for I desire some information on that subject myself. As I do not think it fair for the subscribers to take all and give nothing, I will send forward my way for getting the shape of knives for cutting given moldings. The inclosed sketch will, I think, give the idea without any elaborate description. B C represents the bed, and A B the cutting angle of heads. Lay out 2 or 3 inches on B C. Subdivide into eighths and square up the line H B, which will show the amount of spring required to cut a given depth. From the points thus obtained, the shape of the knife to produce the molding may be readily determined.

From F. H., *Albany, N. Y.*—Referring to the inquiry for a rule for designing molding knives to cut a molding to a given profile, I present a method which I think will be of interest to your correspondent. This problem is of great value to all mechanics who work at molding machines. The first step is to take the size of a molding machine head. Draw it in the position shown in the accompanying sketch. Extend the line A B on the side of head to the right. Next determine how far the knives are to project so that the bolts that hold them will not bruise the molding. Suppose the distance O P on the line A B to be thus determined. Square down from L the center of head. Then from L as center, and L P as radius, draw an arc, producing it until it meets the line drawn from L. Place the given profile with face side up, and so locate it that the upper part of the molding N shall meet the arc from P. Let N R be the thickness of the molding. Be sure that the back C D is at right angles with the line dropped from L. Next, to find the shape of knife, draw a line from each head of the molding parallel with the back, as shown by the letters E X S F O H. Then from L, as center, draw arcs from the points H O F S X E, cutting the line A B already drawn. Square up from each of the points on this line thus located, making the length E E equal to the length E E of the original profile. In like manner set off the other distances to correspond with distances in the original profile. Through the points thus established trace a line which will be the shape of the knife.



Molding Knives.—Fig. 1.—Diagram Accompanying Letter from W. G. O.

The same results may be accomplished by placing the head in any other position, as is indicated by the dotted lines in the engraving. It will be noticed that the knife is of different shape from the molding. For instance, R N of the knife is longer than R N of the profile. To prove that this form is correct take a piece of cardboard. Draw the diagram on it and cut out the profile of the knife, including the shape of the cutter-head, leaving the two parts joined by the line A B. Score on the line A B so that the knife may be folded back. Make E of the knife stand exactly over E on the line A B. Cut out the profile of the molding, leaving it joined to the card by the line N R. Score on this line and fold the molding from you, making E stand directly over E. Keep the two parts in the same position, relative to each other, as in the sketch. Now take a pin and, sticking it in the center of the head L, revolve the head through the molding and it will be found that the members coincide.



Molding Knives.—Fig. 2.—Diagram with Letter from F. H.

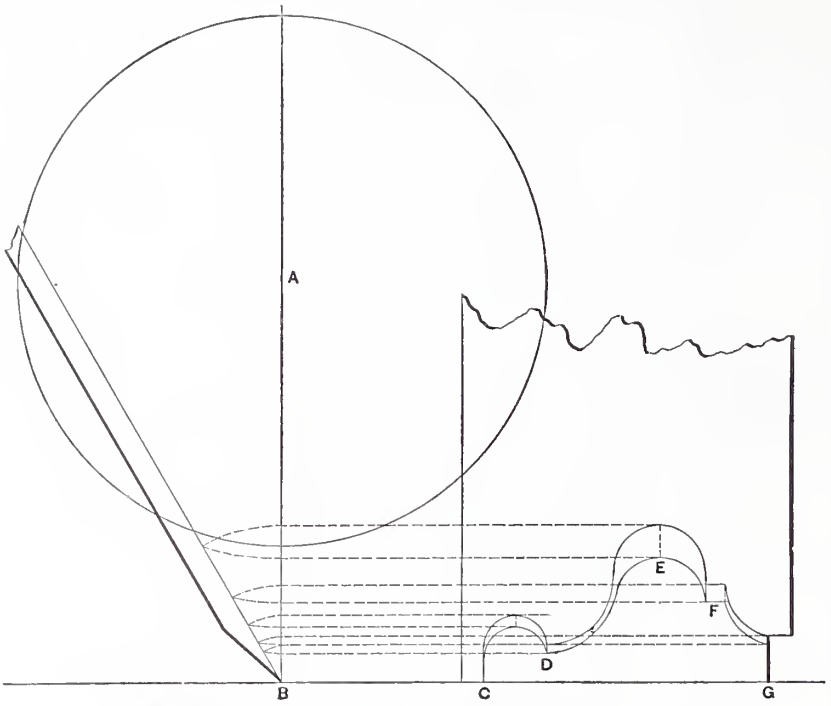
From G. A. W., *Fonda.*—In reply to the correspondent who inquires for rules for determining the shape of molding knives, I inclose a method which I employ. The base line represents the bed of the machine, the circle the head with the knife in position, having the point under the center of the head. Draw a profile of the molding to be made in the position shown, and draw horizontal lines from points in the molding to a perpendicular drawn through the center of the head. From this line, with compasses set to the center, A, of the molding head, strike arcs, producing them until they meet the face line of the knife. Then with compasses set at the end of knife and on the perpendicular line, transfer these distances back

to the perpendicular line, and from the points thus established produce horizontal lines to points over profile of molding. Then a line traced through the points thus established will give the shape of the required knife.

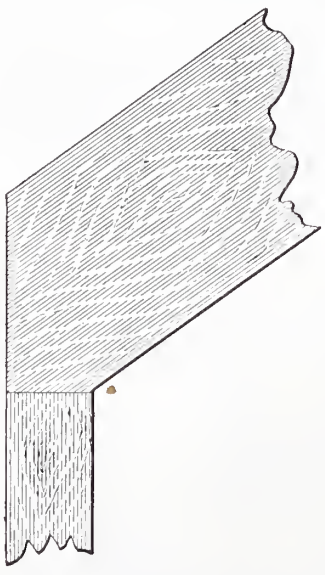
Mechanics Telling What They Know.

From A. A. F., *Cleveland, Ohio.*—I believe that *Carpentry and Building* desires to deal fairly and justly with all its subscribers, as well as with the building fraternity in general. I wish to say a few words which at first thought may be deemed objectionable, but I trust to the impartiality of the Editor for giving both sides a hearing. Several correspondents have asked for more light on stair-building subjects. Referring to R. H. H. in the December number, page 239, I find the following: "Is it that the initiated are too jealous of their craft to care to enlighten the uninformed?" In answer I would say we are jealous of our craft, and I believe justly so, too, for the following reasons: In all large cities stair-building is worked as a separate trade, and all competent stair-builders command at least a dollar a day more at their work than for ordinary joinery. This is because stair-building can be done only by competent men, and they are, comparatively speaking, few in number. It is a branch of the trade that cannot be picked up in a few days or weeks. No one has yet obtained a thorough knowledge of geometrical stair-building without considerable cost in time and study. After an outlay of this kind, would a stair-builder be doing justice to himself and to his fellow workmen to sit down and give away the secrets of his trade without compensation? I will leave the answer to this question to the readers of the paper. I believe that most of the craft are so afraid of their art that they will not make a drawing or a pattern in the shop or in the presence of their fellow workmen, for fear something may be given away without compensation. Few competent stair-builders will give instruction, even for pay. I am well pleased at the discussion in the paper of all subjects relating to carpentry and joinery, but I do not think the trade should expect to learn stair-building without being willing to pay a competent teacher, or at least buying a book, thereby paying the author.

Note.—We are rather surprised to hear such sentiments expressed by a correspondent with whose writings our readers are already familiar. The state of affairs which he represents in the stair-building trade is very different from anything that has ever come to our knowledge, and we think he does the craft injustice in his representations. Judging from the correspondence that has reached us, and also from the very complimentary remarks which have been made by practical stair-builders concerning the stair-building articles which have appeared in this paper, and also from the feeling manifested by mechanics working at stair-building when we have visited shops engaged in that business, we feel sure that A. A. F. speaks only for a small circle, and not for the trade at large. We believe that in no branch of trade has there ever been anything gained by withholding information from those who are anxious to learn, and so far as our experience has gone, those who have been most eager to hide their light under a bushel, have been the ones who had more ignorance than knowledge to conceal. There are far less in number who are competent to discuss stair-building problems, than to take part in questions relating to ordinary joinery and construction. This, we believe, is the reason why so few letters proportionately have been received upon stair-building topics. We have never seen any indication of an unwillingness upon the part of stair-builders to aid in this direction. We feel sure that practical stair-builders will repudiate the sentiments expressed by this correspondent.



Molding Knives.—Diagram with Letter from G. A. W.



Joining Raking and Level Friezes.—Fig. 1. *A Plan in Common Use in Michigan.*

Segment Heads.

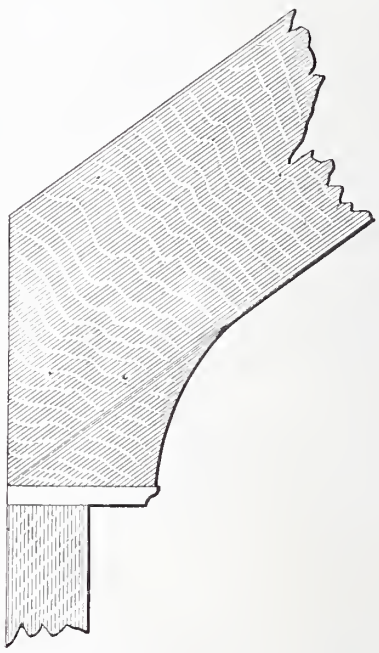
From S. B., *Johnson, N. Y.*—In ordinary windows having segment tops, and which are specified to have 4 inches rise, is it right to calculate from the inside or outside rail in determining this last dimension? The window frames are made square, the segmental head being added.

Answer.—As we understand the question proposed by our correspondent, we think it impossible to give a definite rule. From our own experience we find that custom differs in various sections of the country on points of this kind. It has always been our practice to convey orders of this sort by carefully figured sketches, rather than by written descriptions. We were led to adopt this plan on account of the numerous mistakes and endless disputes which seemed to be the natural consequence of the other method. The question raised is one which affects not only carpenters, but other mechanics, and applies in numerous other cases besides window frames.

Builders' Glossary.

From N. M., *Still River, Mass.*—In reading *Carpentry and Building* I often meet with names and expressions undoubtedly well understood by old carpenters and builders, but which to myself and other young readers are quite unintelligible, and which I fail to find satisfactorily defined in the ordinary dictionaries. Would not a short, well-defined list of terms peculiar to the trade be a desirable feature of *Carpentry and Building?*

Answer.—This suggestion has come in different forms from several correspondents, and believing that there is a generally felt want for a glossary of terms of this kind, we will undertake to supply the same through the columns of *Carpentry and Building,* using illustrations as freely as circumstances may require. Instead of attempting to arrange such a list in alphabetical order, we propose, to let the terms come along as they may, being suggested for the most part by our readers. The list will be none the less valuable in the end because it has not been arranged alphabetically, and it will be much more serviceable during the progress of its publication, if those words are defined first which are really wanted, rather than that a considerable number of terms should be described in which our readers are not particularly interested. We therefore invite all our subscribers, young and old, who have encountered terms that they would like to see defined in our columns, to send their applications forward. The correspondent whose letter we publish above proposes several terms, to which we will give attention in an early number. We shall follow with others in the order in which they are proposed by our readers.



Joining Raking and Level Friezes.—Fig. 2. *Another Common Method.*

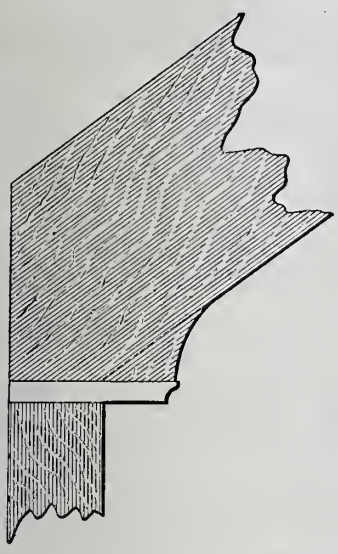
Joining Level and Raking Friezes.

From D. M. W., *Caledonia, Mich.*—Referring to correspondence in past numbers of the

paper, I will present several methods for joining level and raking friezes. Figs. 1 and 2 are the plans mostly in use in this vicinity. Fig. 4 illustrates a method in common use on brick buildings.

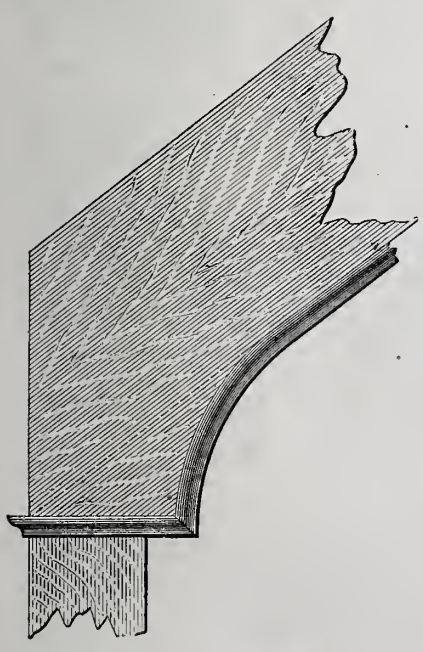
Policy of the Paper.

From E. C. B., *Winsted, Conn.*—The state of affairs is dreadful. It cannot, must not, be endured longer. As great men are called upon to meet great emergencies, I feel called upon to defend our paper from the abuse and calumny heaped upon it by a Canadian correspondent. A short time ago we



Joining Raking and Level Friezes.—Fig. 3.
Still Another Way.

were charged with using "clang, lang, slang." Some one said the correspondents were not refined, that they were even ungentlemanly. I let that offense pass, but now I am aroused. I hurl back the accusation, I deny the allegation, and I defy the allegator. The storm of indignation which will sweep over the land when the subscribers to *Carpentry and Building* read the communication in the March number, entitled "Policy of the Pa-



Joining Raking and Level Friezes.—Fig. 4.
A Plan used in Brick Houses.

per," will be something terrible. I would not be surprised if there are many permits taken out for putting a French roof on the author of that letter. Should the writer put in an appearance in this vicinity he certainly would be branded as he deserves. I sympathize with the Editor. To think that he has been accused of going back on his prospectus. It is indeed too bad. I don't see how he can sleep nights with such a load on his conscience. Just read what the unreasonable correspondent says: "The information is seldom of a sufficiently practical character to be really useful to the young or to the experienced carpenter." Shades of the mighty! All this time I have been under the delusion that I have been storing up wisdom in solid chunks. Did I dream that I saw a house built here from plans published in *Carpentry and Building*, and that when finished it was called the neatest house in all the town? Did I dream that some one wrote "thanks for useful information," and did I dream further that contracts have been made based upon the specifications published in the paper, or have I the nightmare now, and is it possible that I may awake and find that I have been mistaken again?

My heart bleeds for our aged counsellor who wears specs and writes on a shingle. I picture him after perusing A. W. W.'s atrocity. I see him feebly lay down his paper, slowly push his specs to the top of his venerable head and hear him say, with a bewildered stare around the shop, "Boys, I don't think I feel very well." Then he leans his head upon his hands while the tears slowly trickle through his fingers. The "'prentice" takes the opportunity to nail the slack of his trousers to the saw-horse on which he is sitting. It is truly an affecting sight. To think that when he is no longer young to have it said that he is inexperienced. To have such said after the hair is all worn off the top of his head! It is indeed sad. Cheer up, old man, and cover your shingle once more in vindication of our great brotherhood. We will see you through to a man.

Will A. W. W. be so kind as to let us know what "matter" he has referred to that lessens the value of the paper? I must confess that I have not seen anything that answers this description until the publication of his communication. He wants information about gothic framing and stair-building. Open your eyes, my friend, and read the back numbers. Yes, read the back numbers. A. W. W. does not want to be talked to by amateurs. Well, by his classification I am one of them. He probably will not read what I have written for his special delectation. And then there is Baron McG., Kt. of the J. P., who also must subside, and all you other correspondents who have been enjoying this department of the paper. You must write no more because you do not know it all. Therefore you are amateurs. The fact is, there is no need of a correspondence department in the paper at all. All are somewhat inexperienced and untrained. Nobody cares to pay for what you can write. In short—but the subject is too painful to dwell upon. After all our efforts to help each other, and after we have spent years in learning some of the things we have communicated for the benefit of the trade, to be called amateurs, inexperienced men, untrained mechanics and the like, is enough to curdle one's blood, and make a rip-saw grind its teeth.

If A. W. W. will put the Editor's note in his pipe and smoke it, and then go and soak his head in a barrel of shavings, I think it will brighten him up somewhat. I must stop now, for my letter is long enough; but my blood is up, and I feel that I could write twice as much in order to give expression to the indignation which every intelligent reader of the paper must feel toward the correspondent that questions the "policy of the paper."

Are Fire-Proof Buildings Practicable?

From STEPHEN CHESTER, *New York City.*—Referring to the recent tragedy in Park Row, the destruction of the *World* or Potter building, the *Herald* in a recent issue suggests that fire-proof cities may be built. Without questioning the excellency of the suggestion or denying that such construction would be most desirable, it must be admitted that a large proportion of the buildings now existing in this city are not fire-proof. On the contrary, they are so constructed as to be peculiarly liable to be easily set on fire. They possess less powers of resistance to the rapid spread and destructive effects of a conflagration than do the majority of simple wooden structures that are found in our smaller towns and villages. So great is the proportion of structures in this city of the character described, that the suggestion of removing and replacing them with other and safer buildings may not even be considered. It is, however, a well-chosen time to call public attention to the fact that if dangerous buildings may not be removed and absolutely fire-proof structures substituted therefor, much may be done, without unreasonable expense, to modify their dangerous characteristics and to greatly decrease the risks and dangers now attached to them. Perhaps of all the buildings in the city through which flames spread most rapidly and in which destruction by fire is the most sudden and complete, the so-called iron buildings are the worst. The fronts of these buildings are supported by hollow iron columns. The floors rest upon truss girders, and while the only wood used in the construction of these buildings is in the wainscoting, floors, ceilings and window and door frames, there is enough to insure the rapid destruction of the building when the flames are once started and it is constructed in the most favorable way for burning rapidly.

There are many houses in the South and West, notably those in East Tennessee and North Carolina, which are built of square pitch-pine logs. It is almost impossible to start in these buildings a destructive fire, because in their construction no crevices are left for the supply of air. No one would doubt for a moment that if these solid logs were split up into narrow planks and then piled up cob-house fashion, that a spark properly applied, would soon be developed into a roaring flame. In addition to the many interstices for the free circulation of drafts in our modern system of building, the necessity for ventilation, heating and lighting of interiors and shafts for elevators in lofty buildings, provide many perpendicular flues or chimneys through which, in case of fire, currents of air are drawn with terrible force, extending the flame with great rapidity to every story in the building. It is not necessary that the fire should originate in the vicinity of one of these flues in order that its dangerous influence should be felt.

In a room devoid of other openings than the usual windows, and these upon the same level, it would be exceedingly difficult to ignite the floor by building a fire upon it, nor could it be caused to burn freely until an opening should have been made through the floor to admit the air from underneath. On the other hand, if there exists in the chamber an opening into a chimney or a ventilating flue or some perpendicular passage to the upper air, the heated air of the chamber would rush through it, inducing a strong current under the door and from other crevices, causing the flames to lap the floor and supplying all the oxygen required for rapid combustion. Elevators, ventilating flues and smoke flues cannot be dispensed with in any form of structure. In every building not composed of absolutely incombustible materials there will always remain a source of danger. It is, however, respectfully suggested to the public, and more especially to architects and builders, that the degree of danger growing out of their necessary use may be greatly modified by the adoption of simple and inexpensive devices.

In the first place, it is obvious that if in all buildings, but more especially in those of the construction above referred to, all hollow spaces between floors and ceilings, and between walls, except such as are purposely left as necessary flues, be filled in with plaster or even sand, that the building would in no sense be worse, while the rapidity with which flame would spread would be greatly diminished. Secondly, much of the danger growing out of elevator shafts might be greatly diminished by avoiding all open-work devices surrounding these wells and letting the sliding doors communicating with each story be constructed of light, though solid, iron, neatly fitted in grooves, so that when closed the flues should be as nearly air-tight as possible. Thirdly, it is possible to fit in every flue, whether used for ventilation or smoke trap doors, which, under ordinary circumstances, would hang downward against the sides of the flues, but which, by some simple thermo device, should be released and caused to open upward in such a manner as to completely cut off the passage of currents through the flue. Lastly, it is sug-

gested that with a very little additional care upon the part of the builder, the open spaces which, in many houses, are left behind wainscoting and window and door frames, can be completely closed, thus adding greatly to the comfort of those who occupy the rooms, while it would likewise diminish, much more than might be supposed, the facility with which the woodwork could be ignited or continue to burn. Builders and architects may doubtless find at hand many devices that can be easily and cheaply applied in the direction here suggested, and that will very materially decrease the destructible character of our buildings.

STRAY CHIPS.

Mt. Vernon, N. Y., which may be considered a suburb of the city, has a prosperous building business at the present time. Some thirty-four buildings were in progress in that place the first of March, including one church edifice. This number embraced thirty dwellings, costing from $3500 to $7500 each. The general outlook for trade in this vicinity is considered more promising than a year ago.

There is said to be a larger number of buildings now in course of constructiou in San Francisco than at any previous time for several years. A number of the buildings in progress are quite extensive. Among tbese may be meutioned tbe Phelan building. It occupies the point of a triangular-shaped lot, is five stories high, and is built of brick covered with cemeut. A galvanized-iron cornice finishes the work at the roof line. The cost is estimated at over $1,000,000. Tbe street floor is arranged for stores, and the rooms above for offices. The interior finish of this building is white cedar, obtained from the shores of Puget Sound, in Washington Territory.

Burdette writes from Nantucket: "Many of the old houses in the town are shingled all the way over, reminding one of the houses so common in St. John. The shingler, when he shungle, apparently began at the baseboard, shongle right up the front of the house, over the cornice, up to the ridge-pole, wbere he crawled over, went rigbt along shingling, and shangle head first on down the other side of the house to the ground. Perhaps it was not done in this way. I do not assert that it was. I only say, and I say it very meekly, that that is the way it impressed me, and if any man says I am a liar, I will take it back, right immediately, and admit that the shingles were pasted on with gum arabic or the white of egg."

The Odd Fellows of Galena, Md., have just completed a new ball from designs furnished by Mr. T. M. Frasier, architect, of Philadelphia.

In the town of Napoleon, during last year, there were erected four business blocks, costing in the aggregate nearly $25,000.

A building now being erected on the corner of Pine and Davis streets, San Francisco, is faced with Philadelphia pressed brick, transported overland. The trimmings are of granite.

The village of Chestertown, Md., is contemplating a new town hall, to cost $10,000, to be built by the Town Hall Association of that place. Designs have been prepared by Mr. T. M. Frasier, architect, of Philadelphia. The same architect has furnished drawings to Mr. G. W. T. Perkins, of the same place, for extensive improvements about his dwelling.

Along the St. Lawrence River, and especially in the vicinity of the Thousand Islands, there is considerable activity in the building trades this spring. At the head of the islands, on Thousand Island Park, there is just being commenced an extensive summer hotel of liberal dimensions, the entire cost of which will be upward of $150,000. This building is being erected by the Thousand Island Park Association. The work is being done by the day, in charge of Mr. A. B. Shannon, to designs prepared by Mr. Dillenbeck, architect, of Watertown. Further down the river numerous cottages for summer residences are being built. Quite extensive additions are being made to the hotel at Westminster Park, and also to the Thousand Island House at Alexander Bay. On Steamboat Island, Judge Donahue, of New York, is making very fine improvements in the way of grading the island and building. Messrs. Hayden, of Columbus, Ohio, and the Messrs. Packers, of Pennsylvania, are also expecting to lay out oonsiderable sums of money in beautifying the several islands owned by them. The whole locality of the islands will be quite as active in the way of building improvements this season as any other one locality in Northern New York. A number of hotels and boarding-houses are being built on the Canadian side of the river.

A mysterious building accident recently occurred at St. Louis. The front half of a new five-story brick warehouse and store, occupied by the grocer firm of Krafft, Holmes & Co., collapsed suddenly during the night. The roof and every floor sank into the cellar, and the side and front walls fell in upon them. The ruin was complete, and the falling walls so confined to the site of the building that no harm was done to property across the streets, which, in this part of the city, are narrow. The building was entirely new, had been occupied only a month, and was but partly stocked with merchandise. The walls were 2 feet thick for the lower two stories, thence 18 inches thick to the top. The size of the building was about 50 x 120. The inner ends of the floor joists rested on girders supported by wooden posts, their outer ends being built into the brick walls. The foundation to the posts appears to have given way under the load and let the floors down in the middle, and the falling floors pulled the side walls in upon themselves.

Lindenwood College for young ladies, at St. Charles, Mo., has added a wing, which greatly increases its accommodations. In the new building the sleeping rooms are arranged *en suite*, with study parlors on every floor, so that the young ladies do not have to study in their sleeping-rooms, nor yet in a large school-room. Every four pupils have their own private study, with a sleeping-room opening from it at each side. The arrangement proves a very attractive feature, and the school is already full to overflowing. Mr. Charles E. Illsley, of St. Louis, was the architect.

The building business of Denver, Colorado, compares favorably with that of older towns. During the year 1881, 810 permits were granted for buildings; 1253 buildings were erected, at a total cost of $239,000. Of the prominent buildings erected in that city during last year may be mentioned a brick business block, costing $36,000, owned by Mr. T. A. Keener. Mr. L. Cutshaw was the architect. The Republican Publishing Co. put up a fine building from plans prepared by R. S. Roeschlaub, architect. Mr. C. B. Kountze is at present building a stone residence, to cost $45,000, from plans prepared by Mr. A. W. Fuller, of Albany.

The Christian Brothers (Roman Catholic) of St. Louis are building a very extensive college a short distance west of the city limits. Mr. James McGratb is the architect.

Greensburg, Ind., is likely to experience an active building trade this season. Among the buildings to be erected are dwellings for Mr. Charles Zoller, costing $9000; Mr. J. M. Stevens, costing $4500, and Mr. John Foley, costing $2000. A business block for Mr. Thomas White, besides a number of buildings prospected, the character of which is not yet fully decided. Mr. G. A. Wallingford, of Indianapolis, is the architect of the first two residences above mentioned.

A frame court house, 42 x 75 feet, a stone jail, and a jailor's residence, are under contract at Toll Gate, Marion Co., Ala. Mr. John D. Hise, of Bel Green, same state, is the contractor.

An immense hotel and apartment house is being talked of at St. Louis, to be located somewhere on Grand avenue. Plans are said to be in preparation.

A letter from Beatrice, Neb., states that the builders in that vicinity contract for the work by the piece rather than by the day. Our correspondent gives a price list now in vogue. Stone masons build walls at $2.65 a perch of 16½ cubic feet, outside wall measure. Bricklayers lay brick for $10 per thousand, outside wall measure. Carpenters demand $10 per thousand feet of joist and studding, 75 cents per square of flooring, and 50 cents per square of roofing. Painters work for 15 cents per yard, and plasterers 26 cents per yard.

Middletown Ohio, is to have a new Opera House, Mr. John Duffy being architect.

The Missouri Chair Mfg. Co. propose erecting an addition to their works at the corner of Exchange and Second streets, St. Louis, to cost $50,000

Chatfield & Woods, Cincinnati, have erected a new factory four stories in hight, covering about 85 x 125 feet, at an expense of $20,000.

It is generally understood that Mr. Jay Gould has bought a controlling interest in the Union Depot at St. Louis, and that a new depot will very soon be erected. The present depot and grounds have become much too small for the greatly increased traffic at this point.

The East St. Louis Elevator Co. are about introducing the electric light in their elevator. This is believed to be the first case of its employment for this purpose.

The shipment of slate from Slatington and vicinity for the week ending February 18 was as follows: Roofing slate, 1139 squares; school slate, 519 cases; blackboards, 7 cases; flagging, 1302 pieces. The slate trade is exceedingly brisk, and manufacturers have difficulty in filling the orders.

Avondale, Ohio, is to have a new school-house; cost, about $6000.

One of the effects of the higher prices of labor and materials in New York at the present time than during the past few months has been the abandonment of the Metropolitan Opera House enterprise. The change in the plans of its projectors occurred after the land had been bought and the plans perfected and operations commenced. No doubt the same causes will influence other building operations in this city. Almost every large contractor has several instances of this character to relate and all tell the same story. In the case of the Opera House, the original estimate was $1,050,000. The president states, however, that owing to the high prices of labor and materials at the present time the cost would be $1,525,000.

The Hubert Home Club Association is about building a large apartment house on the southwest corner of Fifth avenue and Fifty-fourth street. It will have a front of 50 feet on the avenue, and will occupy a plot 100 feet square. The cost of the building is estimated at $800,000.

The large number of building permits which are being issued from week to week in Boston indicate an early start in the building business the present year. Those who are well informed expect a veritable building boom in that city.

The most important apartment house enterprise now in progress in New York City is called "The Central Park Apartments." It consists of eight distinct buildings, occupying a plot 201 x 425 feet, and facing on Central Park at Fifty-ninth street. Each building will be adapted for thirteen families and will be held by a club of thirteen organized as a joint stock company. The aggregate cost of the eight buildings is estimated at $2,080,000.

Concerning the uptown movement in New York, it is said that there are those who believe than the Vanderbilts will regret before three years are over that they did not build their palatial dwellings on Fifth Avenue opposite Central Park. It is also said that the late A. T. Stewart, when he moved from Chambers street to Tenth, did not go far enough up town.

One of the peculiarities of the building business in New York at present is the erection of large numbers of costly and attractive residences. There are a very considerable number of houses costing a half million of dollars each and upwards now in progress. Fifth and Madison avenues are now pretty solidly built up with luxurious houses, the former as far up as Seventy-second street and the latter six or seven blocks beyond.

Mr. George A. Blake, of Baltimore, is building a residence on St. Paul street, of that city, for Mr. Ross Winans, after plans prepared by a prominent New York architect. The estimated cost is $100,000.

At Brandon, Miss., a $10,000 jail is in progress to designs prepared by A. J. R. E. Zucker, of Meriden, Miss. The same architect has in preparation the plans of a lunatic asylum to cost $50,000, to be located at Meriden; a blind asylum to cost $15,000, to be erected at Jackson, and a deaf and dumb asylum, costing $15,000, also to be erected at Jackson.

At Raleigh, N. C., a court house costing $25,000 is about to be built. In the same State, at Lillington, a $12,000 court house has been let, the plans of which were prepared by Mr. F. B. Austin, of Raleigh.

At Hamilton, Ont., a hospital costing $40,000 is nearly completed. The designs were prepared by Mr. C. W. Mulligan, of that city.

The town of Verbena, Ala., has in prospect a cotton factory costing $75,000. a hotel costing $7500, an academy and a church, all to designs prepared by W. T. Walker, architect, of Montgomery. A number of residences are also in prospect, to designs by B. L. Tarver, architect, of Verbena.

Messrs. Bruce & Morgan, of Atlanta, Ga., are the architects of a $14,000 court house to be built at Tallahassee, Fla., this present season.

A court house to cost $18,000, is to be built at DeLand, Fla.

A $20,000 bank building is being built at Fremont, Neb., to plans prepared by Mr. A. Foster, architect, of Omaha.

Mr. J. L. Coker, of Hartsville, S. C., will build a frame residence during the present year at a cost of about $11,000, to plans prepared by F. J. Hay, architect, of Darlington, that State.

A correspondent in Cincinnati says the rise in wages adds considerably to the cost of a house. Building materials generally, at the present time, are high in price. Last year brickmakers charged for their brick $6 to $7 a thousand, delivered within reasonable distances, which made brick cost about $10.50 per thousand laid in the wall. The building season being remarkably brisk, they raised their prices so that at present brick is worth $12 to $13 at the kilns, which makes them cost $17 to $18 laid in the wall. In 1878 the bids on a certain house averaged $4500. Last month the same set of plans were submitted and the bids averaged $5800.

At Seabright, N. J., what is called a "Bachelor's Hall" is being erected at an estimated cost of $15,000. The owner is Mr. W. H. Roosevelt, of New York. The architect is Robert H. Robertson, of this city. An extension to the Peninsula Hotel is also in contemplation. The Seabright Improvement Company design putting up a hotel to cost $25,000. A number of residences costing from $5000 to $13,000 are also in process of erection. Mr. J. H. Giles, of New York, is the architect on a number of these improvements.

A new court house was built at Elyria, Ohio, last season which in some measure seems to have stimulated the building business. A number of fine residences are in contemplation for the present season. Mr. Hale Clough will build a stone house, costing $10,000, to plans prepared by Joseph Ireland, of Cleveland. Mr. George Hogan will build a frame residence, costing $9000, to plans prepared by the same architect. Mr. William Obitts will build a frame residence, costing about $6000, to plans prepared by L. T. Eldridge, of Cleveland. Messrs. Dickinson, Williams & Bates have under contract residences for P. H. Boynton, F. Smith, L. McLain and O. Root.

Manufacturing interests are gradually assuming shape in the South. The Inman Company, which first proposed to build at Augusta, failing to obtain advantageous terms in that place, now propose to erect a factory in Athens, Ga., to cost $1,500,000. This company is reported as making arrangements to secure water-power upon one of the most advantageous streams in Georgia.

The town of Millbank, Dakota Territory, was named in honor of a Mr. Millbank, of this city, who has recently made a gift to the town of a church edifice to cost $15,000. It is expected the building will be erected during the present season.

At Buffalo, N. Y., a sanitarium and dispensary costing $150,000, is in progress to plans prepared by E. L. Holmes, architect, of that city. The same architect has prepared the plans for a storehouse costing $20,000, and a block of stores costing $30,000.

A college building, to cost $10,000, is to be built this season at Fulton, Ky., to plans prepared by Samuel Scott, architect, of that place.

CARPENTRY AND BUILDING

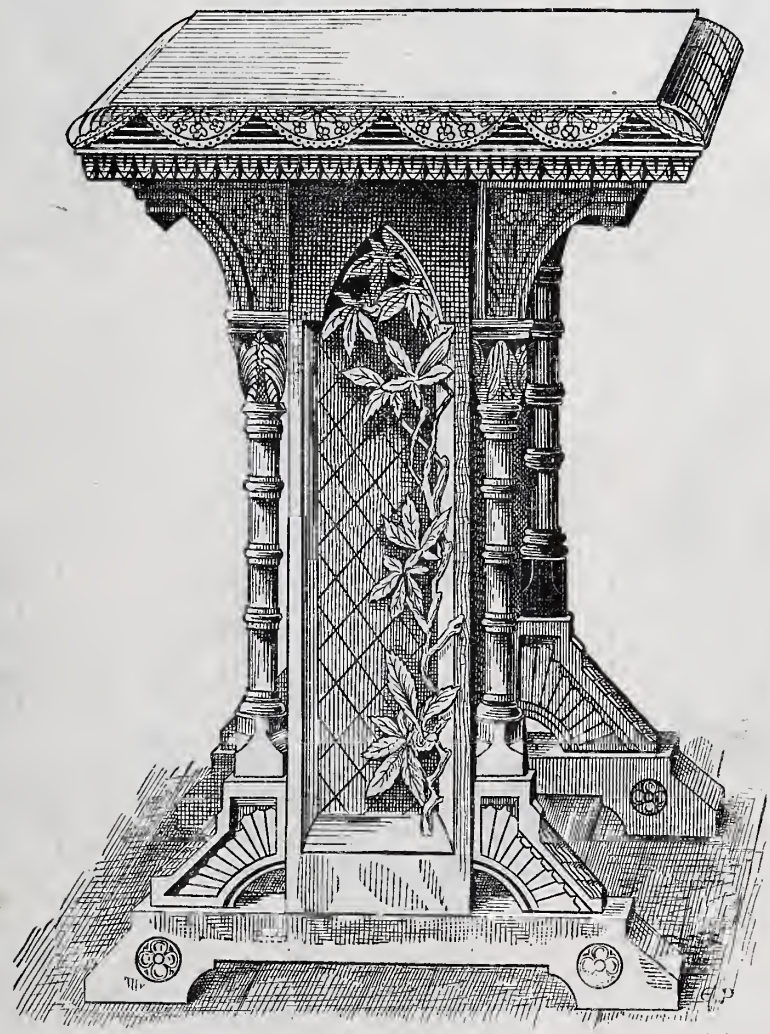
A MONTHLY JOURNAL.

VOLUME IV. NEW YORK = MAY, 1882. NUMBER 5.

Carved Decoration.

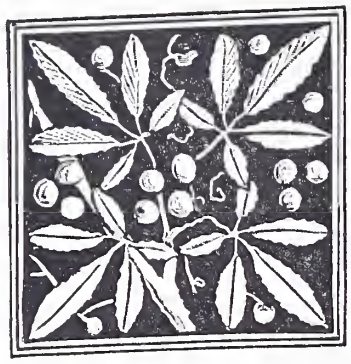
Our first-page engraving represents a small library table, recently turned out by the Cincinnati School of Design. The workmanship is, as usual, of the finest kind, and the work has been performed under the superintendence of Mr. Benn Pitman. Our readers will find that the construction of a similar table, even without working drawings, is by no means difficult, and with the decorative suggestions which they will get from the drawing, as well as the panels which we give on our subsequent pages, they will be able to add decoration to their heart's content. The greater portion of the work is in very slight relief, but it is exceedingly effective. That upon the moldings, after being outlined, has been punched upon the ground, so that the roughened surface and the contrast with the smooth pattern gives the relief. In the end panel the vine is somewhat raised upon a sunken panel. The rosettes on the feet are carved in the solid, and not applied upon the surface, as is very commonly the case. We may say here that it is a very good plan, when buying the pressed-wood rosettes to be found in our upholstery furnishing shops, to set them into recesses instead of gluing them upon the surfaces, where they will project.

We give in Figs. 2 to 14 a number of suggestive designs for carved panels. They will be found suitable for use, both on a large and small scale. Figs. 2, 5 and 7 would look well if carved even 12 or 14 inches square, and Figs. 4 and 8 can be made almost any size and hight. It is well to bear in mind, when trying to make a small design cover a large panel, or to reduce a large one to a small space, that the amount of detail has very much to do with the appearance which the pattern will have on a changed scale. A design which appears very beautiful on a 6-inch panel, if enlarged till it is 2 feet on a side, will very probably seem bold and bare, and give a general idea of poverty. The sassafras in Fig. 10, put on a panel 2 feet high, would be a very uninteresting subject, while on a 6-inch panel it would be rich and attractive. The primrose in Fig. 7, if carved the same size as given in the drawing, would be wonderfully rich, more fit for silverwork or jewelry than wood. This exceeding richness enables it to be enlarged to an almost unlimited degree without rendering the design poor. After the artist has copied his drawing upon the wood, he will do well to get sprays, leaves and flowers, either of the same kind as those he intends carving, or similar to them, and study them, but he must remember that in copying it will not answer to copy too literally. The reason for this may be best explained by referring to literature or fiction. No novelist would think of describing literally the buttons on the hero's coat, the pegs in his shoes, or the stitching of his hat-band, and no novel reader could tolerate such a description if it was given in a book. Now, when we copy plant forms, the same thing holds true, What we want is the character of the plant, the twist of its leaves, and general appearance, which goes to make it look like itself. It does not matter if we do do not put in every vein or every insignificant wrinkle in the bark which we may happen to see. There are other things, like the bending of the stem, the curling of the petals, the notching of their edges and the general character, that is more important, and the eye catches them much sooner than the details and markings, which are very often precisely similar on half a dozen different kinds of leaves or stems. For example, in the primrose, Fig. 7, the leaves seem almost quilted in their rounding-up between the veins. It is not necessary, of course, to count each one of these little quilted divisions in order to give that appearance to the leaf, with its characteristic rolling outward. Now, a greater contrast between this leaf and the lily, Fig. 8, could hardly be found. In the lily leaf the characteristic is smoothness and general parallelism of lines from root to point of leaf. The leaves of each incline to roll outward at their points. If the artist pre-



Carved Decoration.—Fig. 1.—Small Library Table from the Cincinnati School of Design.

serves these two characteristics and follows the outlines with tolerable accuracy, he will be surprised to see that he has made lilies and primroses in spite of himself, and no amount of copying other details will improve the likeness of the leaves to any considerable degree. In a panel (Fig. 11) having the decorative treatment of the apple, as the artist calls it—but we suppose it must be a thorn-apple, since no leaves are shown, the blossoms being out first—there is hardly more than a suggestion of the treatment. The student, therefore, will do well to get more sprays of apple blossoms, and, if he has not time to make his carving with them, he should make such sketches and drawings of



Carved Decoration.—Fig. 2.—Virginia Creeper.

them as he is able, taking pains in the drawings, as in the other cases, to retain the characteristic things about them in which they differ from other plants.

A word or two is necessary in regard to the treatment of these panels in different kinds of wood. If they are to be carved in maple, box-wood, white holly, or cedar, the treatment of most of them will be best if the

Fig. 3.—Hop Hornbeam.

relief is kept very low. In the hands of a first-class man an eighth of an inch from the surface to the lowest point would be enough; the ordinary workman should be satisfied with a quarter of an inch. In most of the exquisite carvings put into the new Vanderbilt houses in this city, about which so much has been written, the designs have very little

Fig. 4.—Japanese Treatment of the Almond.

relief, and this, too, though they are exceedingly bold in appearance. This appearance of boldness is produced by keeping all the unimportant parts very light and close to the background, and then raising the curled portions of the leaves up very sharply. The stems, points of leaves, buds and knots, stand up with nearly vertical sides, so that the relief seems to be greatly exaggerated. If a design, however, is to be carved in black walnut, or is to be ebonized, or, in fact, to be carved in any dark-colored wood, we think it

Fig. 5.—Natural Treatment of the Laurel.

is not best to limit the relief very much. Some of the finest carvings that we have ever seen in rosewood, were almost entirely relieved from their backgrounds, being very

Fig. 6.—Raspberry.

deeply undercut. We think, with the patterns which we show, it is not best in a dark wood to limit one's self in any degree in depth, for it is hardly possible to take the pattern too far away from its background; of course, it would not be necessary to make the relief greater than the object carved would have if laid down in the positions shown. In every case the border should be as high as the highest point in the panel—in other words, the design should be carved from the solid and the margin left the full hight of the design. The reasons for this we have explained in former articles on this subject. The Virginia creeper, Fig. 2; hop hornbeam, Fig. 3; bamboo, Fig. 9; the olive, Fig. 12; the sassafras, Fig. 10; the winterberry and wild rose, Figs. 13 and 14, can all be used with a stamped background. It is made simply by star-punching the other articles in relief to do them justice. The curling of their leaves is such as to make it impossible on a perfectly flat surface to get a really good effect.

Necessity and Invention.

Given the best material, ample facilities and a high order of inventive skill to devise something new, such material, facilities and skill had much better be turned to other account

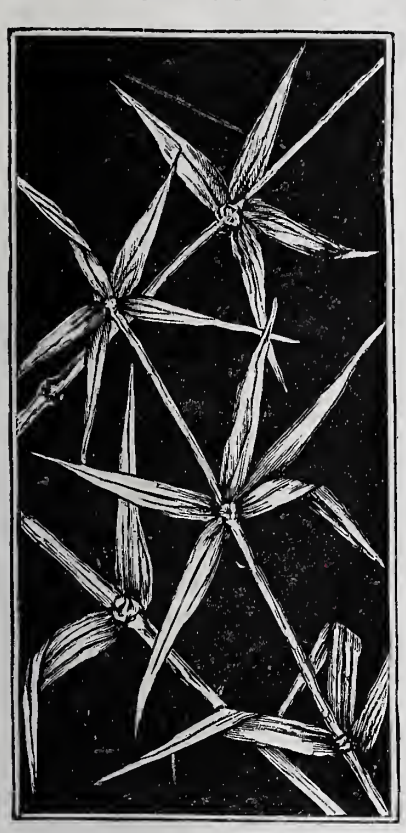
Fig. 7.—Primrose.

if there be not a demand for the article in question. Invention is the offspring of necessity in the fullest sense, and unless the something produced fills a niche in the wall of wants, the inventor had better have devoted his brains, time and material to other employment. It is the disregard of this

Fig. 8.—Lily.

phase of the great natural law of "demand and supply" that cumbers the patent office with specifications of so many inventions that come to naught. The number of im-

proved boot-jacks, rat-traps and miscellaneous articles which have been patented is legion. Men mistake invention for a business, and enter into it as they would into selling dry goods or making shoes; possessing a knack



Carved Decoration.—Fig. 9.—*Bamboo.*

for invention they bring forth an array of articles intended for almost every use in the calendar. Some of these are very cunningly contrived, no doubt, but the reason why they fail to bring remuneration to the inventor for the time, labor and money expended in perfecting them is that the world's economy does not require them. There has been a waste of forces. The vital trouble lies in the fact that these inventors look at the matter from the wrong end. They set about to make

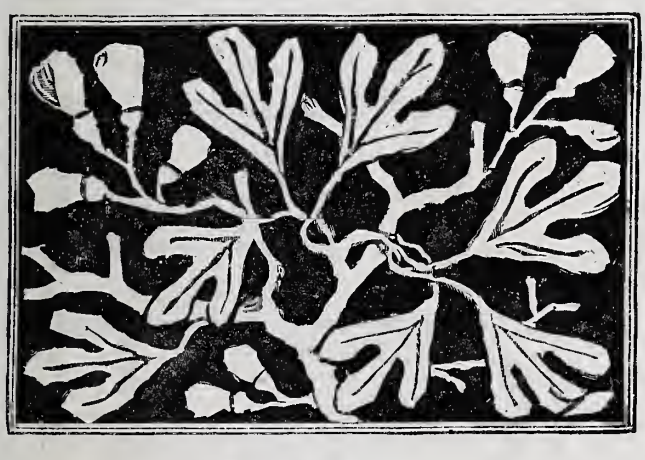


Fig. 10.—*Sassafras.*

"something," trusting that its radically new character will find a place for it, instead of trying in the first place to discover what thing the exigencies of this or that trade demand. Sometimes one of this class will succeed in hitting upon a valuable invention. We will say that his work is some piece of mechanism connected with cotton manufacture. He immediately begins to adapt the principles of his invention, or a modification of them, to iron-working or some other branch of industry, and oftentimes loses what he gained in his mania for inventive experiment. The "professional" inventor rarely succeeds in the long run.

And yet the field for invention is by no means closed. There is every encouragement to-day for inventive genius. Great and revolutionary as have been our improvements in machinery, industry awaits and will pay for others. There is need of more perfect appliances for treating cotton between the field and the factory; a machine is wanted to manipulate jute and like fibers, to the end that we may make such staple products and compete with the poorly-paid labor of countries across the water. A fortune awaits the successful inventor in these and many other fields, but in every one the necessity must first exist. In many instances the pressure of circumstances almost compels the invention of the thing desired. We see this nowhere better illustrated than in the annals of prison life. Some of the most curiously contrived tools known to mechanical experts have been fabricated by prisoners in their endeavors to escape. Here an imprisoned convict, lacking tools or material, contrives to make a key by scraping lead from a water pipe, melting it in a spoon over a fire made from splinters of his furniture, and casting it into form, and with it opens intricate locks. Others perform almost superhuman feats in the way of producing inventions for cutting iron bars, drilling through iron doors, breaking through heavy stone walls, and constructing ladders, weapons, files, saws, hammers and other tools. The same conditions exist where legitimate invention is concerned. It does not depend so much on the facilities that the inventor has at his command as on the necessity for the thing which he seeks to produce.

Fig. 11.—*Decorative Treatment of the Apple.*

Fig. 12.—*Olive.*

Glue that will resist water, it is said, may be produced by boiling 1 pound of glue in 2 quarts of skimmed milk.

Japanese Houses.

A writer in one of our exchanges says tho Japanese houses, although ingenious examples of woodwork, do not last long. Tokio requires to be rebuilt once in every period of seven years. A German chemist proposes as the only way to give security to their buildings, that the erection of timber houses should be abandoned. Stone is not much used in Japan, owing to the scarcity of materials for mortar. It has been discovered, however, that much of the surface of the country is of volcanic formation, and corresponds with puzzalona. This material, if

Fig. 13.—*Winter Berry.*

mixed with 1-6th of lime, forms an excellent cement, which might be utilized in the erection of houses. The Japanese have so readily adopted European customs that it may be

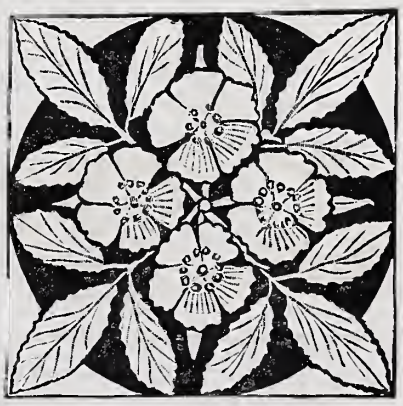
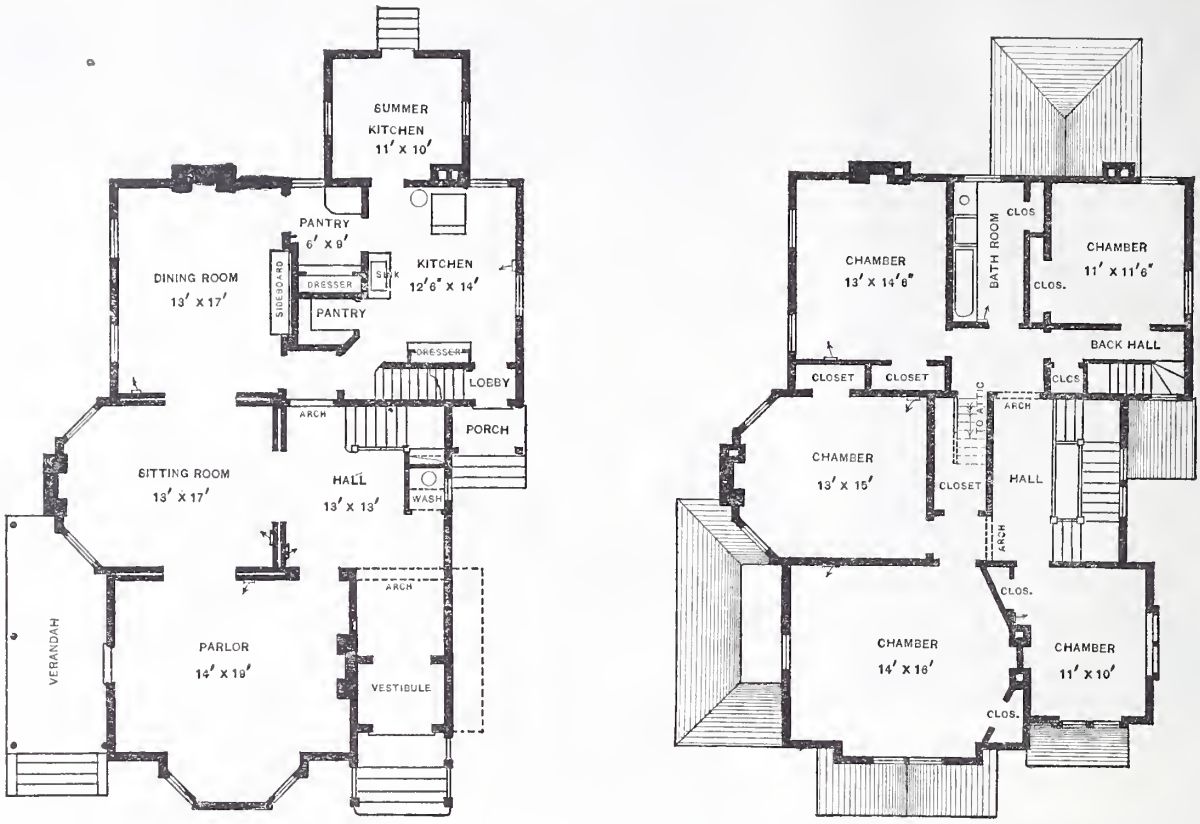


Fig. 14.—*Wild Rose.*

assumed they will follow the suggestion of the German chemist. Concerning these remarks we would say that the trouble about building in Japan is that there is too much volcanic

origin to allow the erection of solid construction in edifices of any kind. Accordingly, the people are compelled to choose between destruction by fire and destruction by earthquake. Escape from a burning thatch is possible, but from falling walls the chances are very much less. The popular mode of building in Japan is to erect a double-frame bamboo lattice and fill in with a mixture of mud and grass. The structure is crowned with a bed of *fleur de lis*. It is surrounded with a hedge of reeds, and is quite picturesque in appearance.



House Plans.—Figs. 1 and 2.—First and Second Floor Plan, Submitted by "Myn," No. 92.—Scale, 1-16 Inch to the Foot.

House Plans.

We invite our readers' attention at this time to two additional sets of floor plans submitted in the fifth competition. We had intended publishing these in connection with the article in our last issue, but we found space did not permit, and therefore they were carried over to the present time. The plans submitted by "Myn," No. 92, have commendable features about them. The reason they were rejected by the committees was the extra number of rooms. A summer kitchen is provided on the lower floor, making five rooms in that part of the house. This, however, might have been excusable, because the summer kitchen as planned is not really a part of the main house, but there are five distinct chambers on the second floor, which is manifestly contrary to the terms of the competition.

The principal entrance is provided with a very commodious vestibule, just inside of which is a portion of the hall cut off from the staircase hall by means of an arch that is large enough for coat and hat stand, a table and chair, or whatever might be desired. The stairway is so disposed in the hall as to make it a feature not only of utility, but of decoration. A wash-stand is conveniently located under the stairs, the closet in which it is placed being lighted by a window from the north. Communication is had with the back part of the house through a lobby cut off from the staircase hall by a simple arch. Parlor, sitting-room and dining-room communicate with each other through sliding doors, while the sitting-room and staircase hall are likewise thrown into one, as occasion demands, by means of sliding doors. The service from kitchen to dining-room is through what would be called in the cities, a butler's pantry. The kitchen is conveniently arranged, and it has no outside door on the north side of the house front. It is not necessary to particularize with reference to the second floor. It has many features of convenience to commend it, all of which will be noticed by our practical readers. The chimneys in this design are carried up on the outside walls, with the exception of the one in front, a feature which is excellent in the matter of designs, but which some will object to as being likely to cause defective draft under certain circumstances. We think all this can be satisfactorily managed, however, with good construction, and therefore we rather like the design on this account.

Another very desirable arrangement of rooms, and one radically different in its features, is presented in the second set of engravings, being made from the plan submitted by "Queen Anne," No. 130. While this designer has kept himself within the letter of the specification, there are certain defects in his design which, in the minds the committee, were sufficient to reject his plan in favor of others. The entrance from the side porch, between the back stairs and cellar stairs, in some respects is clumsily managed. Remembering the supposed situation of the house, with a possible lawn along the south side, a side entrance would be very desirable; but to be compelled to go half way down cellar in order to get out of the door in

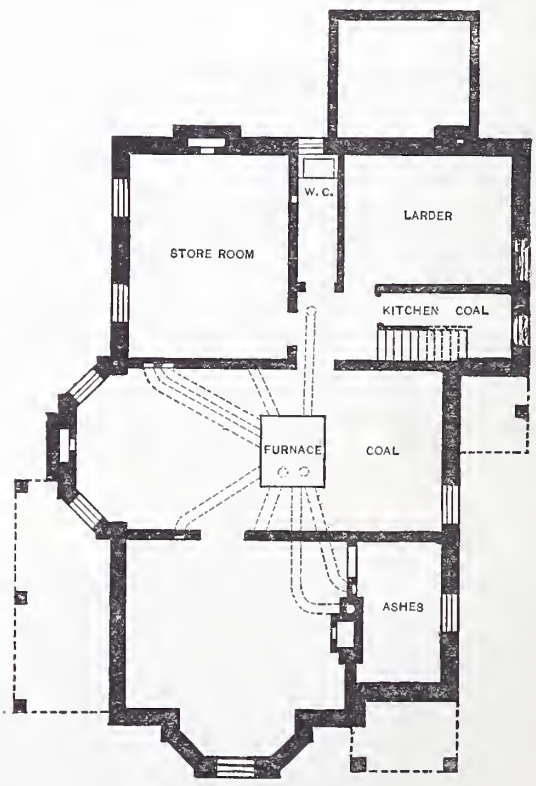


Fig. 3.—Basement Plan, Submitted by "Myn," No. 92.—Scale, 1-16 Inch to the Foot.

question does not seem quite the thing to do. Another serious objection is found in the front stairs. There is an unfortunate narrowing of the stairs at the hight just above the first landing, which spoils an otherwise very desirable arrangement. The fact that the dining-room is on the north side of the house, while the kitchen occupies the southwest corner of the building, commanding a good view of lawn and street, will appear to many quite an objection. We have referred to this feature in the plans of some of the competitors already, and therefore need not dwell upon it further at this time. With all this said, however, we commend this set of plans as among the most desirable submitted in the competition, the strict terms of the conditions of the competition aside. Our practical readers will see the merits of these two sets of plans, and we have but little doubt they will be put into actual use in many sections of the country.

Strikes as a Symptom.

Nearly every class of workmen employed in the building trade in New York City, have been engaged of late in striking for higher wages. In most cases, through the thoroughness of their combinations, they have succeeded in attaining their object. The great activity in building which has prevailed during the past two years has brought into requisition a large force of mechanics and laborers, and given them steady employment at wages that are almost unprecedented. They have shared fully in the prosperity of the trade. So long as the business continued active and profitable, the demand for good workmen and competition among employers insured a normal advance of wages, and there was no intimation of strikes. But latterly there have been premonitions of a check in building operations. There have been symptoms of a danger of overdoing. The rise in wages and in the prices of material has so advanced the cost of building and pushed up rents that the limit of an effective demand appears to be reached, if, indeed, it is not already passed. Accordingly, employers begin to feel compelled to resist applications for still higher wages. It is only when that point is reached that strikes begin. But the first symptoms of a falling off in the demand for new buildings do not operate at once to check the work already going on. The men are still busy, and existing contracts must be completed, and, consequently, strikes are likely to be successful at first. The carpenters, the joiners, the masons, the stonecutters, the painters, the plumbers, and all the rest of them have their unions and associations, through which a stoppage of work may be effected. The builders are anxious to complete what they have in hand and to fulfill their present contracts as speedily as possible, and so they are apt to yield to avoid embarrassment.

But notwithstanding the success of most of the strikes in the building trade, their action may, nevertheless, be in conflict with their own best interests. It gives another turn to the screw which is checking the operations upon whose activity they depend. It adds another item to the cost of building, gives another pressure to the rents that are already resisted, and strains the expense of living to a higher degree. The probable effect of this will be to produce a reaction in the building trade and a period of comparative dullness. When people refuse to pay such high rents and feel unable to buy such costly buildings, there is no alternative but to stop building or to build cheaper. Then employers will be obliged to pay lower wages or to discharge their workmen. When that time comes there will be strikes against reductions, but they will not be successful, because builders will be in a position to dispense with a certain amount of labor without loss, and the force of competition will be thrown among the workmen themselves. They will be idle part

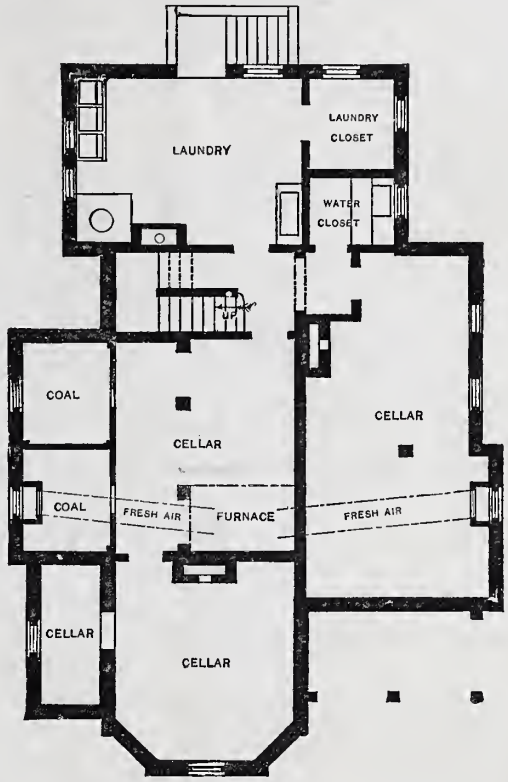
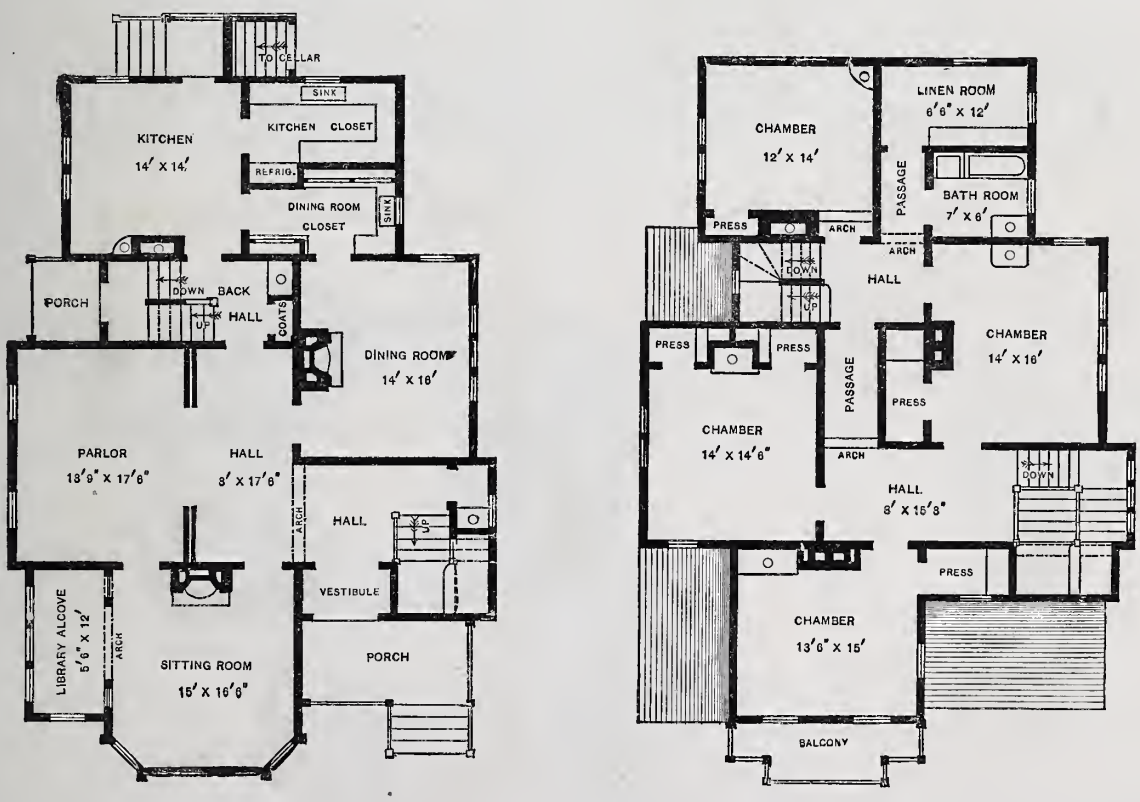


Fig. 6.—Basement Plan, Submitted by "Queen Anne," No. 130.—Scale, 1-16 Inch to the Foot.



Figs 4 and 5.—First and Second Floor Plans, Submitted by "Queen Anne," No. 130.—Scale, 1-16 Inch to the Foot.

of the time, they will be compelled to accept lower wages when they work, and if they are intelligent and thoughtful they will realize that they contributed by their persistent demands, quite as much as venturesome capitalists, to the reaction that followed their season of prosperity.

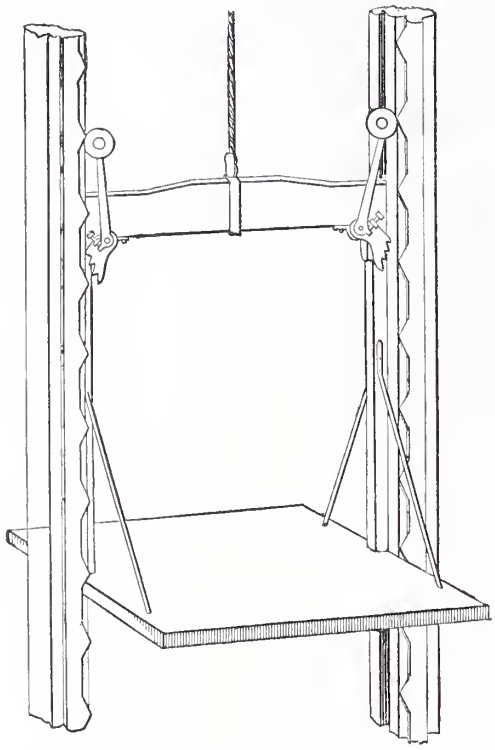
Labor unions, when used as an instrument of coercion to force wages beyond the level which employers would be induced by self-interest to pay, contribute to the violent fluctuations to which our material prosperity is subject. They prevent the free play of the influences of supply and demand at just those critical times when they should effect an easy adjustment of industrial forces. By insisting upon carrying wages too high, and keeping them up too long, they compel an abrupt check upon activity, and a positive depression, when an earlier, but more gradual, slackening would have brought business into an equable channel of normal progress. Our industries are subject to violent ups and downs. When prosperous, they are apt to be "booming." Prices go too high, wages insist on closely following them, and when the inevitable overdoing is reached there is a reaction, and labor suffers first and most. Strikes rarely occur on the rise, but generally at the turn and on the fall. They are not a symptom of prosperity. When the market is active, and prices good, every reasonable demand of workingmen is generally granted, and cannot be long refused. It is when the demand for products, of whatever kind, falls off, supplies accumulate, and prices begin to go down, that employers pause, refuse to advance wages further, or feel compelled to reduce them. Then we hear of strikes; strikes in factories, in mines, and in the trades. They indicate a check in prosperity, perhaps an impending reaction, possibly a coming depression, and among the forces that make these violent or severe, are labor combinations which prevent a normal adjustment of one of the most important elements in industrial operations.

An English exchange has a column devoted to the subject of the flexibility of marble. Several examples are quoted in which marble slabs have bent when unsupported at the centers. The most noticeable one is in the Alhambra in Spain. Marble under the influence of heat will certainly sag when supported at the ends only, and a slab may easily droop a couple of inches in 3 feet in a comparatively short time. In many structures such an action would be most destructive, as will be readily conceived.

NOVELTIES.

AUTOMATIC CLUTCH FOR ELEVATOR.

Figs. 1 and 2 represent in elevation and detail Henricksen's automatic safety clutch for elevators, which Messrs. Clem & Morse, of Philadelphia, have recently commenced manufacturing. As may be seen by the very clear engravings presented, the clutch consists of two cams or eccentrics, provided with strong, sharp teeth on the outer side, mounted on a heavy shaft journaled into a solid angle brace or bracket, and securely fastened to the framework of the elevator.



Novelties.—Fig. 1.—An Elevator Provided with Automatic Safety Clutch.

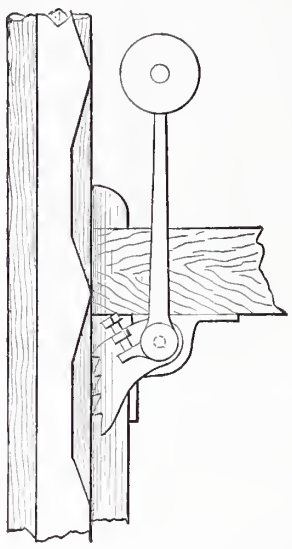


Fig. 2.—Enlarged View of the Clutch, showing Construction.

They are operated by means of upright levers surmounted by rubber rollers, which are made to run over a series of bosses or projections. At the usual rate of speed the rollers pass over these projections without operating the cams, but as soon as the speed is perceptibly increased, either by the breaking of the cables, counterweight, ropes, or any part of the impact of these rollers against projections, it causes them to rebound and throw the cams in contact with the guide posts, thereby instantly stopping the descending elevator. Several advantages for this device are claimed, among which may be mentioned the following: As the safety clutch is in full sight of the elevator man, and as every part is in constant motion, it cannot corrode, stiffen or gum up. Since there are no springs, governors, triggers or other unreliable mechanism to become deranged or broken, it is always ready for service and does not require constant overhauling. As this safety clutch is operated by the speed of the descending elevator, its action is positive; the greater the speed, the quicker the action; the heavier the load, the tighter the grip. The clutch here shown works and sets automatically and may be regulated to any rate of speed. It operates as readily on an empty as on a heavily loaded cage, and on this account is claimed to be superior to any other safety attachment now in use. A number of very severe trials have been made of this device, among which may be mentioned, 300 instituted at the Mechanics' Exhibition in San Francisco, between August 15 and September 15, 1880. It did not once fail to operate in these tests. The first time that it was used practically was in the falling of an elevator, August 17, 1880, with six passengers in the cage. Nobody was in the least injured. The device has been before the public but a short time, comparatively speaking, but in that interval a number of practical tests have been made, in each instance, we are assured, working entirely satisfactorily.

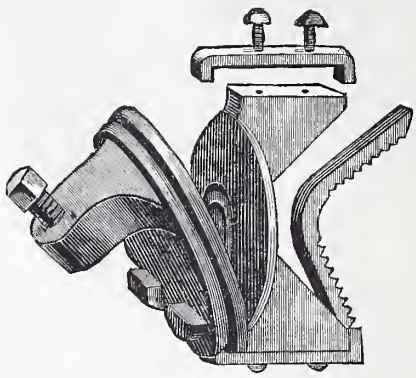
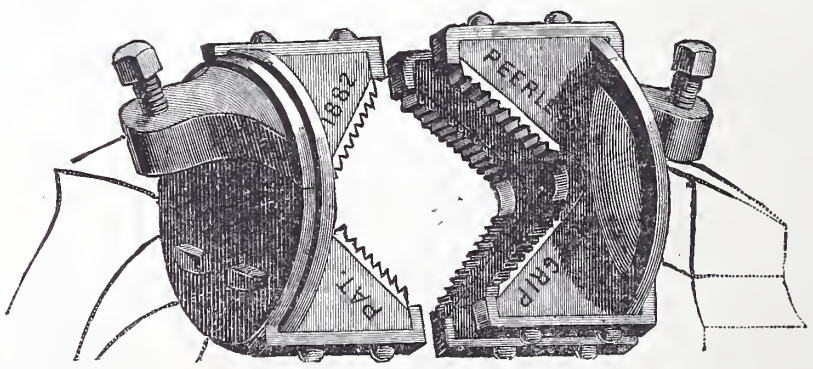


Fig. 4.—Details of Parts of the Grip.

THE PEERLESS PIPE GRIP.

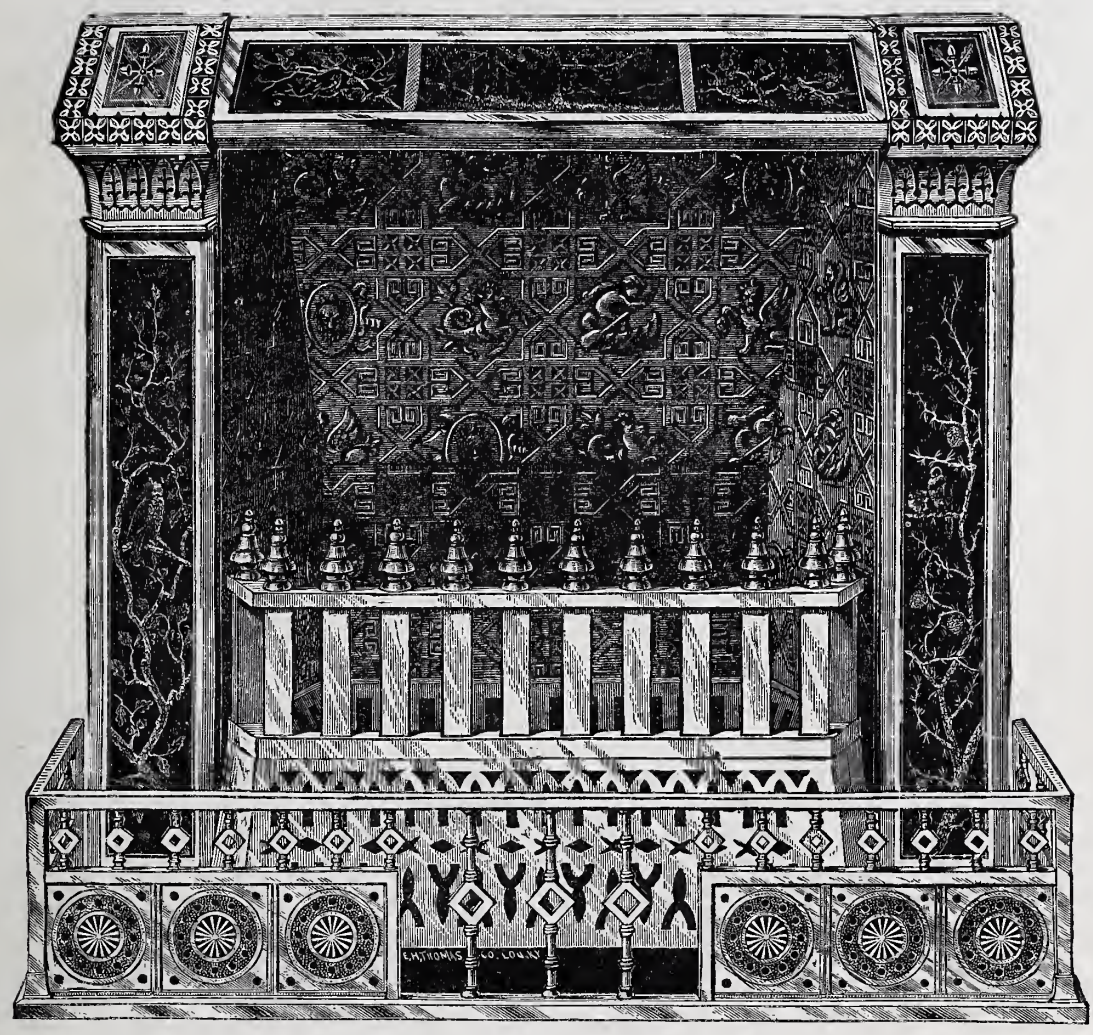
The Prentiss Vise Co., of No. 23 Dey street, New York, have recently put upon the market what they call The Improved Peerless Swivel-Jaw Pipe Grip, a representation of which is afforded by Fig. 3 of the engravings. This pipe grip is adapted to use upon any iron-worker's vise. This engraving shows its appearance when attached to the jaws of a vise ready for use, while Fig. 4 illustrates each part in detail, showing the features of construction. The grip is fastened to the jaws of the vise by means of studs projecting from the face-plate which hook under the lower edge of the jaw, and a set-screw which engages the top of the jaw and acts against the studs mentioned. The swiveling motion is obtained by a double face-plate, as clearly shown in the engraving.



Novelties.—Fig. 3.—The Peerless Pipe Grip Attached to the Jaws of a Vise.

The body of the grip is made of the best quality of malleable iron. The holding bits which, by inspection of the engraving, it will be seen are easily removed, are of tool steel. They are so constructed as to be readily sharpened, tempered, or replaced whenever required. The special advantage claimed by the manufacturers for this article is that every part is interchangeable, and that all parts can be duplicated on call. The swivel jaw of this grip automatically adjusts itself to any required angle on long pipes, and thereby obviates loss of time in the adjustment of bearings or rests otherwise required to bring it to a proper bearing in the jaws. This same feature enables the

operator to hold short pipes, couplings, nuts, thimbles, plates, &c., in a vertical, slanting, or horizontal position, thus securing great economy of labor and time. Two sizes are made, the smaller one adapted for use in 3 to 4¾-inch vises, and holding pipe from ¼ inch to 2 inches in diameter. The larger size is adapted to vises from 5 to 7 inches, and holds pipes from ½ inch to 5 inches in diameter. The smaller size weighs 6 pounds, and the arger one 11 pounds, thus making the tool easy to be carried from the shop to outside work. Its adaptability to all kinds of vises used by machinists, blacksmiths, and steam and gas fitters, makes it particularly acceptable in mining operations, and under other situations remote from machine shops.



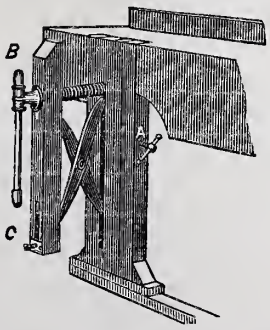
Novelties.—Fig. 5.—New Grate Setting, Manufactured by Messrs. Fischer, Leaf & Co., Louisville, Ky.

NEW GRATE SETTING.

The attractive grate-setting represented in Fig. 5 of the engravings is manufactured by Messrs. Fischer, Leaf & Co., of Louisville, Ky. The setting is comprised of the tile frame, fire basket with cast-iron back, and a brass fender. The special feature of this set is the tile frame employed. It measures over all 31½ inches high by 30½ inches wide. The opening in the frame is made for a 6-inch tile, thus adapting the setting to a mantel the opening of which is 42 inches. The tile frame is made of two uprights, having pilasters with ornamental caps, and joined together by a top piece. The caps and top piece are so constructed as to form a projecting hood. The manufacturers state that it has been found, by experience, that a tile frame made of plain or ornamental brass moldings is of very little use in protecting the wood mantel against scorching. The hood stands out about 2½ inches, forming a panel-head, and being part of the construction of the grate-setting, makes a handsome finish. Another feature about this grate-setting is the decoration of the frame. The panels are etched on a plate of highly finished brass. The designs therefore admit of change, according to the requirements of purchasers. The ornamentation is made to harmonize with the other decorations of the room. After the panels are etched they are gold-plated, so that all that is necessary to keep them clean is to preserve them free from dust. The construction is such that if any accident occurs by which the decoration is marred, the panels can be removed and replaced at pleasure. Mr. John W. Williamson, who is well known throughout the country as a designer and decorator, is the author of some of the features embodied in this setting.

EVANS'S IMPROVED BENCH VISE.

Figs. 6 and 7 of the engravings represent a bench vise which will undoubtedly prove of interest to our readers. In the form entitled "low vise," the jaws are down on a line with the top of the bench. The back jaw slides vertically in grooves, as may be seen by the engraving, and for the form called "high vise," all that is necessary is to loosen the set-screw A and raise the jaws B to the required position and then tighten the screw A. The construction of this vise is such that the jaws are firm, and the fact that they are parallel is a still further advantage. The standard upon the right hand is in two parts, being 1½ by 2½ inches and 2½ by 2½ inches in section respectively. The set-screw presses the 1½-inch piece against the jaw and holds it in that position rigidly. The parallel motion of the jaws is obtained by what the inventor calls an "equalizer," which is an arrangement of levers fastened at their upper extremities and joined together where they cross. A set-screw is provided at the bottom of the outer jaw, and is so arranged as to act upon a metal bar in a manner to set the front jaw in or out, thus varying the angle of the bite in a way to suit the individual requirements of the workman. This tool, by its special features, is well adapted to the requirements of stairbuilders, carpenters, joiners, wagon-makers, carvers, &c. Being simple in all its parts, it is not liable to get out of order. The vise is manufactured by Mr. William Peoples, 113 Webster street, Allegheny City, Pa.



Novelties.—Fig. 6.—Improved Bench Vise. View showing the Vise Arranged with its Top even with Top of Bench.

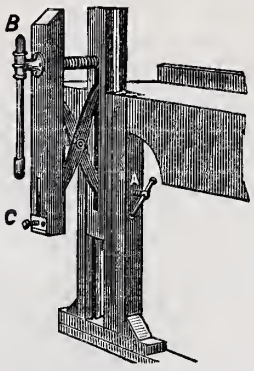


Fig. 7.—The same Vise lifted Above the Top of Bench, being held in Position by the Set-Screw A.

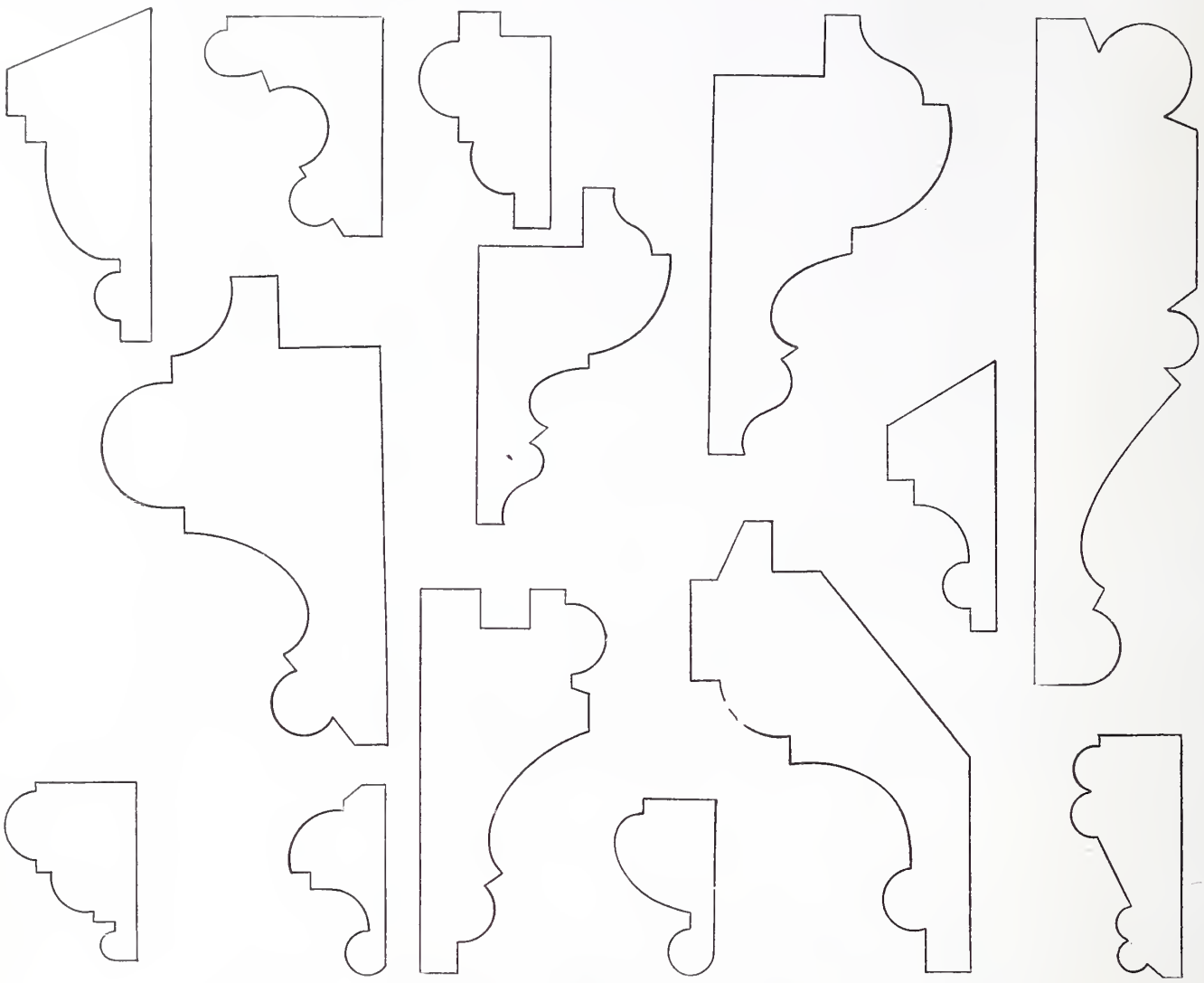
NEW PUBLICATIONS.

INTERIORS AND INTERIOR DETAILS, WITH AN INTRODUCTION, DESCRIPTION OF PLATES, AND NOTES ON WOOD FINISH, by William B. Tuthill, architect. Published by William T. Comstock. Fifty-two plates; 10 by 13½ inches; bound in cloth, with side title. Price $7.50.

The most recent addition to the literature of architecture is likely to be quite as acceptable to our readers as any book that has been pubhsed for some time past. This work is representative in the sense that some of the most able architects of New York, Boston, Providence and Chicago, have contributed to its pages. Interior treatment in the erection of dwellings has of late years received more attention than formerly, with the result that homes have been made more beautiful. This work aims at presenting the principles which underlie successful interior finish and decoration. The plates have been compiled so as to cover a large scope of interior design. They are given as suggestions as well as examples, and from them may be gathered many ideas which may be used as motives for other compositions, as also for special articles of furniture. The frontispiece is a perspective view of the hall in the residence of Mr. Ashbel Greene, of Englewood, N. J., and is by Mr. Bruce Price, of New York. Following this is an entrance hall in perspective by L. B. Wheeler, architect, the details of which are given in the succeeding plate. Messrs. Gould & Angell, an architectural firm with whom our readers are already acquainted, furnish several plates, among their designs being a side of hall with details, staircase and bay-window with details, side of dining-room with details and examples of window and door finish, wainscoting, &c. Messrs. Rossiter & Wright, Mr. Edward Dewson, Messrs. Burnham & Root, Mr. William A. Bates, Mr. Wm. B. Tuthill, Mr. J. Pickering Putnam, Messrs. Cabot & Chandler, Mr. W. S. Purdy, and Mr. F. F. Ward, are other contributors. A preliminary chapter contains notes on wood finish, giving a number of recipes for the treatment of the various woods employed in interior finish.

Moldings for Interior Finish.

Through the courtesy of Mr. J. B. Shengle, superintendent for Mr. A. McAllister, Builder, of Cleveland, Ohio, we are enabled to present our readers with two plates of designs of moldings employed in the interior finish of a house recently erected for Mr. Andrew, Euclid Avenue, Cleveland, Ohio. These moldings are as original in design and conception as is it possible for articles of this kind to be. They were designed and worked specially for the house in question, producing an effect alike satisfactory to the owner, the architect and the builder. The patterns, as here presented, are full size, and will undoubtedly prove of interest to all who are engaged in designing inside finish, and to those whose business it is to make work of this kind.



Full Size Sections of Moldings for Interior Finish.

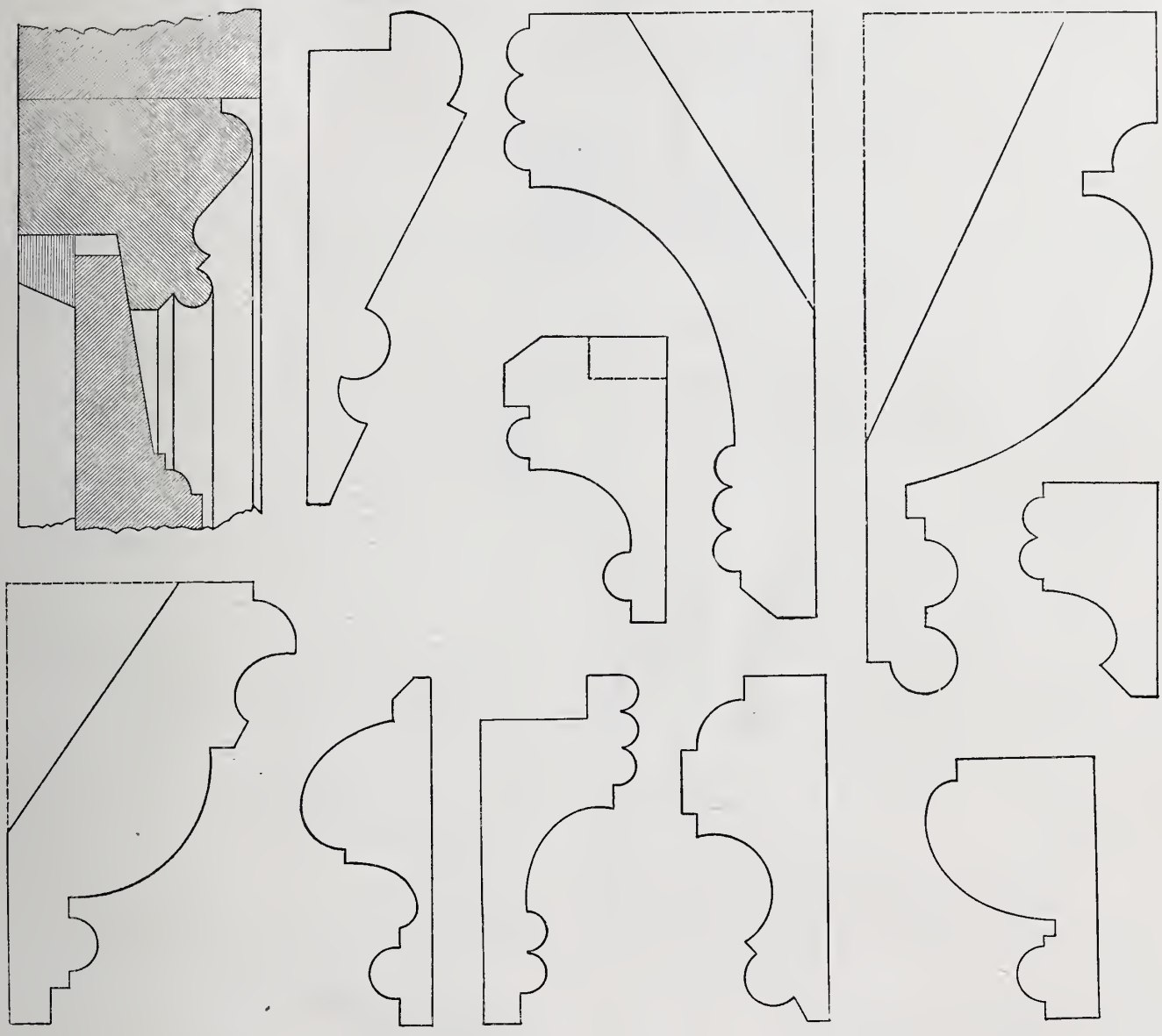
NOTES AND COMMENTS.

THE GENERAL INTRODUCTION of iron in bridge building has strengthened the opinion in the minds of engineers, and the public generally, that wood for the purposes of bridge construction is not a durable material. In contradiction to this fact, however, some historical statements which have recently been brought to the attention of the London and Middlesex Archæological Society, are quite interesting. A bridge across the Thames, in London, known as the Old Fullham Bridge, was erected in the year 1729 to supply an immediate and temporary want until its place could be occupied by a more permanent structure. Instead of being a comparatively ephemeral affair, it has survived and done good service all these years. In the interval, two ponderous stone bridges over the Thames have become ruins, and have been supplanted by more modern structures. The bridge in question is a timber structure, and it shows in a striking manner the wonderful endurance and longevity of wood as a bridge material.

IT MAY BE of interest to our readers to know that a concerted effort is being made by several of the engineering societies in favor of a bill before Congress, creating a United States Commission to use the testing machine constructed by Mr. A. H. Emery, and now employed at the Watertown Arsenal. The design is that this commission shall test iron, steel, timber and other materials, and publish the results of such tests for the benefit of the country at large. The importance of such a movement can scarcely be overrated. The tables upon which architects and engineers at present base their calculations, are, for the most part, such as have been prepared from tests of very small specimens, and, in many cases, from tests made upon material of a different character from that employed in modern engineering and architectural work. This is an effort to which every person of influence should lend his help. The machine which has been perfected is a marvel in its way, and is well adapted to all the purposes to which it can be put. There is only needed a competent commission with the necessary funds at its disposal to render it serviceable in the highest degree.

IN OUR REPORT of building operations and wages in our last issue, we uttered a word of caution to mechanics about killing the goose that lays the golden eggs. We alluded to the stoppage of certain large building operations in this city, and the effect which the continual increase in wages was likely to have upon the building business. Since that number went to press the Metropolitan Opera House scheme has been renewed, which proves that, in the estimation of the

managers of that enterprise, the increase of wages, and consequent increased cost of building, is not sufficient to make the investment unprofitable, and that, therefore, they are going ahead. In another column we print an article referring to the meaning of strikes, calling attention to the t o frequent manifestation of this symptom among the workingmen of this country at the present time. It is to be hoped that the action of mechanics generally will be tempered with prudence, and that nothing will be done to lessen the amount of building which the country is prepared to do this year. While we are in favor of mechanics receiving the highest rates of wages in reason, we caution them against unreasonable demands, and such peremptory action as may check building to an extent to react upon their own heads.



Full Size Sections of Moldings for Interior Finish.

FEW PERSONS who have not had occasion to investigate the underground condition of New York, have any idea of the network of tubes, pipes and sewers, and other constructions which are found in its streets. Near the surface of the ground there is a network of gas-pipes. A little lower down come the great mains of the Croton; and branching from these, in parallel lines, are the smaller mains to supply the streets. Below these are the sewers with the house connections. A map of these pipes, so far as known, is about as complicated in appearance as the network of wires overhead. In the avenues where the elevated roads run the conditions are still further complicated by the frequent recurrence of foundations for elevated railway pillars. The foundations for these not unfrequently straddle Croton mains, and work their way down through the network in most extraordinary fashion. At the crossings of the great or more important streets the lines of pipe become so tangled that it is almost impossible to locate them, and there are no known maps in the city surveyor's possession giving all the details, or even all the lines. Down town the electric-light wires, the pneumatic tubes, and the steam-heating pipes are added to the others, and it is surprising that the trench diggers are able to find space in which to place the last pipes laid.

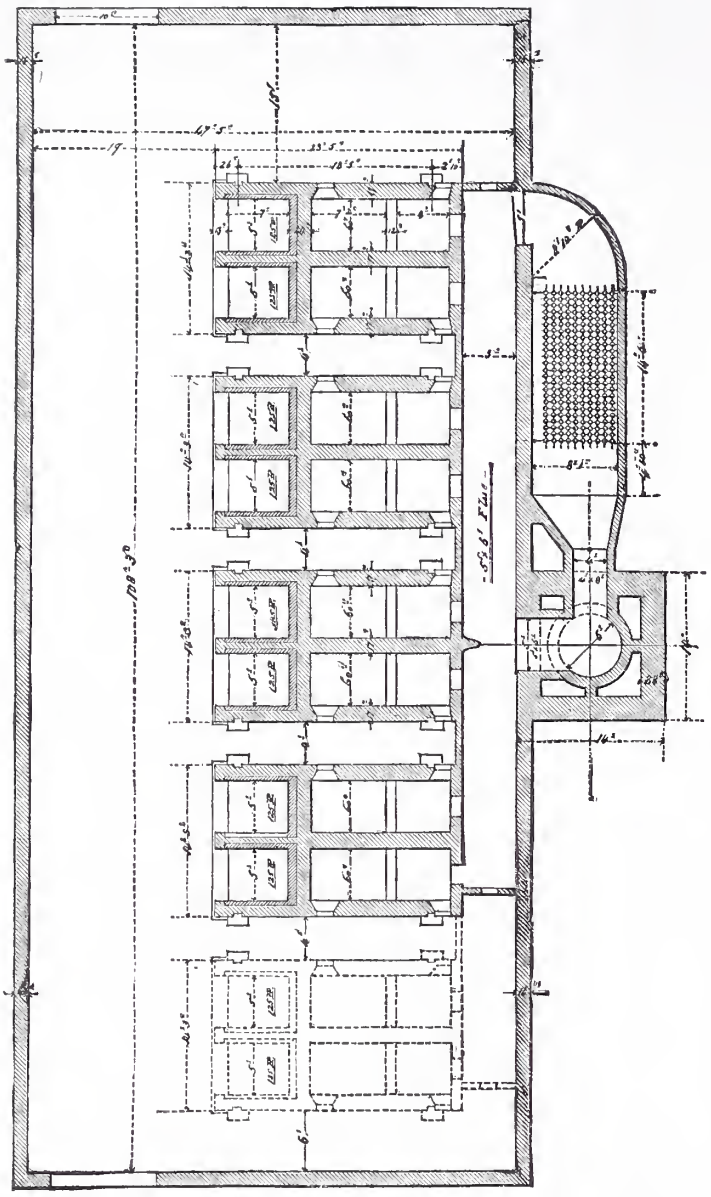
THE DAILY PAPERS contain frequent mention of accidents attending the use and management of the electric light. Some time since the assistant machinist at the Laclede Hotel, St. Louis, mounted a step-ladder for the purpose of making some slight changes in a light that was burning with full intensity. The carbon was drawn down, after which one of the wires conducting the electricity was taken hold of. At the same time, in order to steady himself, the machinist grasped a gas-pipe running over his head with the other hand. The instant he did so a connection was formed through his body, with the result that he was jerked off his feet in the twinkling of an eye, without being able to unclasp his hands from either the pipe or the wire. The situation was critical, as he was actually suspended in the air and was receiving the full benefit of a charge of the electric fluid, which was twisting him into all kinds of shapes. Fortunately, however, the gas-pipe broke under his weight, which broke the current as well, and let him fall to the floor. It was all over in less time than it takes to narrate the circumstance, but the machinist found his hands so badly burned and his body so lamed by his brief experience as a conductor and the effects of his fall, as to be unable to move for several days.

A RATHER PECULIAR FIRE occurred a short time since at St. Johns, New Brunswick, which strangely illustrates the value of automatic sprinklers. It was in a mill provided with automatic fire extinguishers or sprinklers. The drying-room where the fire occurred was filled with yarn. A watchman passed through it at one o'clock in the night, but saw no sign of fire. Fifteen minutes later, however, in an adjoining room he smelled smoke, and following it found the drying-room on fire. A man on the floor below was at once called, but before he reached the upper room he heard water dropping upon the floor in the drying-room. One length of hose was within ten feet of the room and another within twenty-five, but before the men could get them out the automatics, six of which opened, had drowned the fire out and there was no use for more water. Within five minutes from the time the fire was discovered water was coming through the floor of the drying-room. The loss was so small that the firm did not make any claim on the insurance companies. One great value of the automatic sprinklers seems to be that they can not only start as soon as the fire starts, but they can keep at work in a smoke so dense that it would drive a human being out of a room. In very many cases insignificant fires have driven out those who attempted to extinguish them.

SAMUEL J. CRESWELL, of Philadelphia, has been awarded the contract for the cast iron work of the Lehigh Valley Railroad offices, at Mauch Chunk, and the large iron portions for the Swarthmore College, Delaware County, Pa.; also the stable fittings for the West Philadelphia and Lombard and South Street P. R. W. Co., Philadelphia.

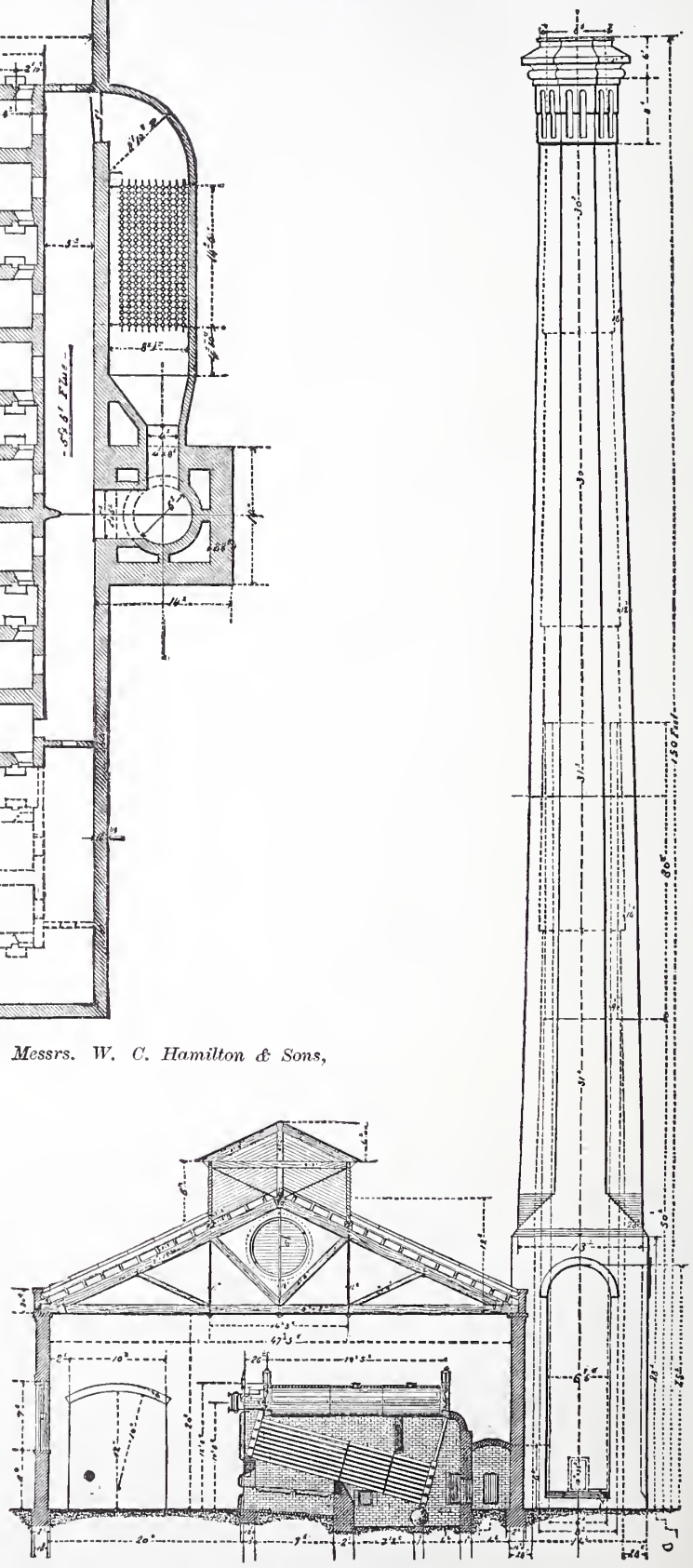
Boiler House and Stack.

Architects and Builders are frequently called upon to design boiler houses and chimney stacks in connection with manufacturing establishments, and in many instances they have no better guide to their efforts than the examples which exist in their own immediate neighborhoods. The subject is one to which very slight attention has been given in architectural and engineering publications. We take pleasure, therefore, in presenting herewith an example of good practice, taken from the work of a well-known firm.



Plan of Boiler House and Stack, Recently Built for Messrs. W. C. Hamilton & Sons, Philadelphia.

The illustrations show an elevation of the stack, together with an end view and plan of the boiler house, recently erected by Messrs. W. C. Hamilton & Sons, at their paper mills in Philadelphia, from designs of the Babcock & Wilcox Company of this city. The house is 111 feet long by 50 feet in width. The length is somewhat greater than is necessary, in order to provide boiler room for 250 horse-power extra at some future time. There are eight boilers, set in four batteries of two boilers each, each being of the well-known water tube type built by the company. The boilers are ranged crossways of the house, and back of them, against the wall, is a flue 5 feet by 6. From this flue the products of combustion pass through the wall and through the economizer, shown at the back of the house, and thence into the chimney, which is located at the middle west side of the house. There is a direct connection with the flue, which can be used if desired, cutting the economizer out. The chimney itself is 150 feet in hight, and the inside flue is 6 feet in diameter at the bottom. There are two sections of 31 feet, and two of 30 feet each. The lower section has 20-inch walls, the next one 16, the third one 12, and the top section 8-inch. As will be seen from the drawing, the stack is octagonal in its section, and is about 14 feet square upon the base. The batteries are separated from each other by 4-foot spaces, which gives easy access all around the settings for cleaning, &c. The fire-room is 20 feet in the clear between the settings and the walls, and at one end there is a 15-foot space left for pumps, meters, &c. At the opposite end of the boiler-house there will be a 6-foot gangway. The boilers are 125 horse-power each, aggregating 1000 horse-power in all as now set, or 1250 when completed. Each individual boiler is composed of eight sections, with eight 4-inch tubes in a section, The steam and water drums are 36 inches in diameter and 18 feet 8 inches long, and have manholes in the rear head. The mud drums are 18 inches in diameter and 55 inches long, with nozzles for blow-off pipe. Crosby pop safety valves, steam gauges, stand pipe, check valve, stop-valve, and blow-off valve, are all provided. The fronts are ornamental in design, of full width and length, and return 9 inches around the brickwork at the sides.



Transverse Section through Boiler House.

Each battery has four fire-doors, four ash-pit doors, and four large doors to give access to the ends of the tubes. The design is neat,

effective and well considered, both in regard to the size and arrangement of the house; and the stack itself we consider a model in its way. The drawings are fully dimensioned, and those who have particular interest in the matter will observe that the sizes are well considered.

CORRESPONDENCE.

In further evidence of the close scrutiny which every statement published in this journal receives at the hands of its readers, we call attention to the letters we have received commenting on Mr. Randall's calculation of the strains in a floor truss, which was published in our March issue. We have had occasion, before this, to remark that erroneous statements, by reason of the earnest replies and criticisms which they call out, sometimes do more good than assertions which are so correct and matter-of-fact as to fail to attract attention. We believe this will be the case in the present instance. Mr. Randall's critics are evidently in earnest and are thoroughly convinced of the correctness of their position.

We allow a considerable proportion of our space this month to be occupied by the discussion of questions which belong principally to bridge engineering, but which, in their application, are of interest to a very large class among our readers. The careful manner in which F. F. analyzes the Howe truss, and goes through the calculations required in designing a bridge to comply with the specified conditions, avoiding formulæ and such expressions and calculations as are not ordinarily understood by mechanics, we think will be appreciated by our readers generally. While this correspondent is undoubtedly correct in the conclusions reached, so far as he goes, there are some things which he has not taken into account.

The "Policy of the Paper," a discussion of which was commenced by the correspondent who signs himself A. W. W., still attracts attention. We have space for only part of the letters received.

Strength of Floor Trusses.

From H. F. A., *Bangor, Me.*—I think Mr. Randall, whose communication on floor trusses was published in the March number, is mistaken in calculating the strain. My method of solving the problem is as indicated in the accompanying sketch. We will call F F the center of the cord, then A B will be 3½ feet. In the triangle A B F, the line A B represents the downward pressure 21 tons, and A F the tensile strain on the truss rods. The line B F represents the crushing force along the chord F F, or the tensile strain A G. By calculation, we find the hypothenuse A F of the right-angle triangle to be 14.43 feet. As we now have all the sides of the triangle, we may find the other forces by proportion 3½ feet is to 21 tons as 14 is to the answer. This gives 84 tons as the crushing force along F F, or the tensile strain on A G. Again, 3½ feet is to 21 tons as 14.43 is to the answer, which will be the tensile strain on A F and G F. Calculation shows this to be 86.58 tons. From this it would seem that your correspondent has made a large mistake in his calculation. Therefore I have thought it would be well for your readers to correct the error in their papers before they had been misled by it.

From ALBERT F. HILL, C. E., *New York.*—Conspicuous among the "Correspondence" of your March number is the description and analysis of a floor truss by Mr. G. P. Randall, of Chicago, and both truss and method of calculation are recommended to the imitation of other builders. But for some to the writer unaccountable reason, Mr. Randall has made such serious errors in proportioning this truss, as well as in his statement of the method of calculation, that it becomes necessary to call attention to his article, in order to prevent others from following the directions given by it. There can hardly be any doubt that Mr. Randall will be able to explain how those errors crept into his manuscript.

As it is desirable to keep this discussion as free as possible from confusing technicalities, we shall, in the first place, accept the truss and its condition of loading just as described by Mr. Randall, viz.:

"This beam rests upon two posts 42 feet apart. The floor and beam are continued beyond the posts, but this is not taken into the account in computing the strength of the beam. This beam lies in a longitudinal position in the middle of the width of the building, which width is 40 feet, hence the floor area, supported in part on and by this beam, is 40 by 42 feet, or equal to 1680 square feet. We will suppose this floor to be covered with people as thickly as they can stand, and this manner of packing has been found to be equivalent to 120 pounds to the square foot, to which we will add 30 pounds for the weight of floor, and we shall have an even 150 pounds to a foot, or, for the whole floor, 252,000 pounds. One-half of this would be supported by the side walls of the building, so that the beam would only have to sustain 126,000 pounds, and as this beam is itself supported at each end, and the load divided between the ends and points of support at B and E, it follows that the truss, of which the beam forms a part, only carries two-thirds of this 126,000 pounds, or 42 tons. This gives a downward pressure at B and E of 21 tons each, the other 21 tons being divided equally between the points F and F—10½ tons each—but these weights are not any part of the load supported by the truss." Or, in other words, we have a queen post truss to deal with, of

Length of span... 40 ft.	Depth of truss... 4 ft.
Panel length..... 14 ft.	Load on ea. post. 21 tns.

To find the strains in the different members of this truss, resulting from this condition of loading, we shall—as Mr. Randall intended to—call to our aid the principle of the resolution of forces. If three forces P, Q and R, in the same plane, Fig. 2, acting at one point balance, three lines parallel to their directions will form a triangle, A B C, whose sides will be proportional to the forces. In trusses each member may represent the line of some force or strain, and it is evident, therefore, that if we know the load or strain in a vertical or horizontal member of a truss, and the angle of inclination of the adjoining member, we may readily determine the amount of strain in that member and the other component one; taking, therefore, the strain lines (in Fig. 3), we know that B′ A′, F′ A′ and A′ G′ acting at A must be balanced under the load upon the truss. But the strain upon A′ B′ is known—21 tons—therefore, to find the strain in F′ A′ and A′ G′, draw F′ B′ parallel to A′ G′, and the sides of the triangle, F′ B′ A, will be parallel and proportional to the strains in A′ B′, F′ A′ and A′ G′. Divide now A′ B′ into 21 equal parts, and by the scale thus established measure F′ B′ = A′ G′, and also F′ A′ and the strains sought for are obtained, or by simple proportion:

$$A'B : 21 \text{ Tons} :: B'F' : x \text{ Tons}$$

$$4 : 21 :: 14 : x;\quad x = \frac{21 \times 14}{4} = 73.5 \text{ Tons}$$

for the compression in F′ B′ and the tension in A′ G′. The strain in A′ F′ is readily found by the proportion:

$$4 : \sqrt{4^2 + 14^2} :: 21 : x$$

$$4 : 14.56 :: 21 : x$$

$$x = \frac{21 \times 14.56}{4} = 76.44$$

or strains exactly double of those given by Mr. Randall.

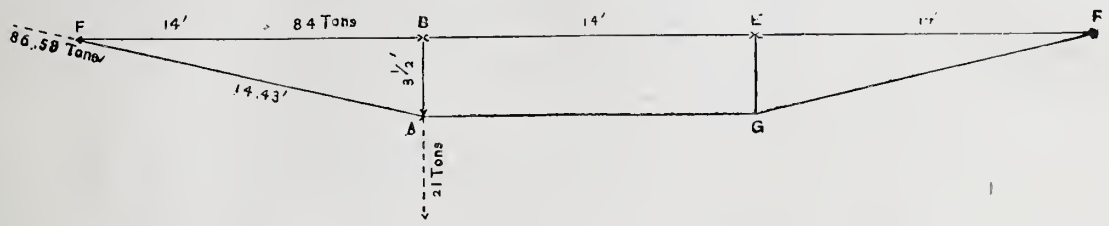
The compression in A′ B′ is, of course, equal to the load = 21 tons. If we desire now to establish a formula for the strains in the different members of a queen post truss of general form (Fig. 3), with load on posts, we have, by simple substitution, in our previous equations, and calling the load on one post W:

$$\text{Compression in A} = \frac{\text{W A}}{h} = \text{tension in D.}$$

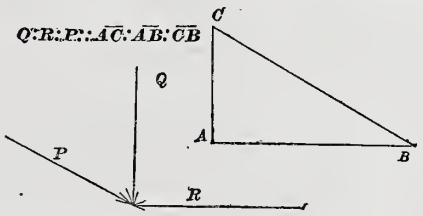
$$\text{Compression in } h = \text{W}$$

$$\text{Tension in B} = \frac{\text{W B}}{h}$$

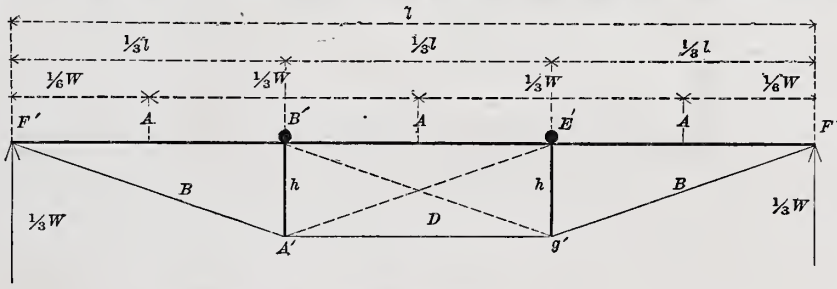
Referring to the dimensions of his truss, Mr. Randall goes on to say: "By mathematical, then, as well as by mechanical arrangements, we find that in the inclined part of these truss-rods we have a tensile force, or force of pull, as it is sometimes called, in the three rods of 180 tons, and a resisting force of 38.22 tons, or a factor of safety of 4.7, which is rather small, but it, in fact, greatly exceeds this, and for the reason that the weight on the floor can never attain to 150 pounds to a square foot. A factor of safety of from 5 to 6 I regard as sufficient for such trusses." So does the writer consider a factor of 5, even of 4, suffi-



Strength of Floor Trusses.—Fig. 1.—Diagram Accompanying Letter from H. F. A.



Strength of Floor Trusses.—Fig. 2.—The Resolution of Forces.



Strength of Floor Trusses.—Fig. 3.—Strain Diagram.

cient for this kind of truss, especially if well put together. But, as will be shown directly, Mr. Randall's truss shows barely a factor of 2 in the iron rods (which is virtually no factor of safety at all, since the maximum load would strain the iron to its elastic limit), and, in the timber-chord, he has a factor of safety of not quite 4, while he really ought to have not less than from 8 to 10.

The strength of members in the queen post truss described is as follows: "Two sticks 7 by 12, which are unsupported sideways for 14 feet. This gives for their ultimate resistance to crushing by Rankine's formula, 282.06 tons, and the strain upon them being 73.5 tons, we have $\frac{282.06}{73.5} = 3.83$ factor of safety. This value is for pine timber; if oak were used it would be ¼ more. Next we have "three iron rods 1¾ inch diameter," which, together, give an ultimate tensile resistance of 180 tons—taking the ultimate tensile strength of iron at 50,000 pounds per square inch, = gives $\frac{180}{76.44} = 2.35$ factor of safety.

It is evident from the foregoing that the truss, as described, has not the strength required to sustain the load for which it was designed, and its only margin of safety must be sought in the difference between that load and the probably lesser one it will be required to actually resist.

From Mr. Randall's description it would seem that the floor beams are carried by cross-girders resting on the side walls and on the truss at the points B and E. If this were not so—that is, if the stringers rested upon the chord directly—then, in addition to providing against compression in the beam F′ F′, it would have to be dimensioned for a uniformly distributed load.

Another method of obtaining the strains in a queen post truss is as follows, viz.:

Let l be the length of span, h the depth of the truss, and W the total distributed dead and live load upon the whole girder, and designate further by C compression and by T tension. With the weight of the floor concentrated over F′ F′, and the struts B′ A′ and E′ G′, each will be loaded with ⅓ W, hence ⅔ W will be the whole load on the truss, and the abutment reactions at F¹ and F′ will be, therefore, equal to one-half of that load, or ⅓ W each. Now, the moment of a force at any point is its amount multiplied by its perpendicular distance from the point about which the moments are taken; and, further, the moments of the strains acting upon a body in equilibrium which tend to turn it in one direction, about a certain point, are equal to the moments of the strains or forces which tend to turn it in the opposite direction.

To find the strain of compression in the horizontal chord A, produced by the tension of the rod B, we shall take moments around the foot of the strut h. The forces opposed to each other are the reaction of the abutment and the strain on the material, the lever-arm, or perpendicular distance of the former from A′, is the panel length $\frac{l}{3}$, and the distance, or lever-arm of the horizontal compression in A from the point A′, is the depth of the truss h; therefore, it follows from the equality of the moments that

$$C \times h = \frac{W}{3} \times \frac{l}{3};$$

hence $C = \frac{W\,l}{9\,h}$ for the compression in A, and since A′ G′ is equal in length and parallel to F′ B′, it follows that $T = \frac{W\,l}{9\,h}$ is the value for the tension in D.

Since the chord strains are the result solely of the strains in B B, these latter may be determined by remembering that the C, the strain in A is the horizontal, and the strain in h the vertical, component of the same. Hence the tension T′ in B is obtained thus:

$$T' = C \times \frac{\text{length of A}'\text{ F}'}{\text{length of F}'\text{ B}'}$$

Substituting now the loads and dimensions of Mr. Randall's truss, we obtain for

$l = 42$ ft.; $h = 4$ ft. W = 63 tons for compression in top chord,

$$C = \frac{W\,l}{9\,h} = \frac{63 \times 42}{9 \times 4} = 73.5 \text{ tons} = T,$$

the tension in D; and for tension in B we have

$$T' = 73.5 \times \frac{14.56}{14} = 76.5 \text{ tons; or}$$

as before, double the strains given by Mr. Randall.

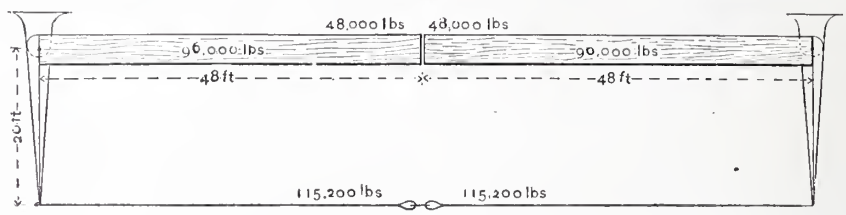
Another and quite serious defect in Mr. Randall's truss is the lack of the counter-bracing A′ E′ and B′ G′. Not only, according to his own statement, is the girder put into the town hall of Marmette, Wis., continued over the posts at F′ F′, and therefore, like all continuous girders in buildings, liable to distortion from the unequal settling of foundations and supports, but it is also easily conceivable how in such a place, part of the floor may be densely packed with people, while the other part may be occupied only by a very small number of people, or how the people massed at the exits preparatory to leaving the hall, would naturally bring a concentrated load upon one strut of the girder and leave the other strut unloaded, except with the deadweight of the floor, and in this manner produce distortion of the truss.

To prevent this distortion counter-braces (dotted diagonals in Fig. 3) are introduced. They only come into play when one strut B′ A′ is loaded and the other strut E′ G′ is unloaded, or *vice versa*. This produces a reaction of the abutment nearest the load, twice as great as that of the other, and this difference of reaction must be compensated for by a tension-bar of a strength sufficient to take up the difference in the strains of the horizontal components of the rods B B resulting from this unequal loading. Thus, suppose the load ⅓ W on the right-hand strut removed; the reaction of the right abutment will be ⅓ of this, or 1-9th W., and of the left abutment ⅔ of the panel load, or 2-9th W. Again, taking moments as before, we obtain for the horizontal component of the left diagonal $\frac{\text{2-9ths W} \times \frac{1}{3} l}{h} = \frac{2\,W\,l}{27\,h}$ and for the horizontal component of the right diagonal $\frac{\text{1-9th W} \times \frac{1}{3} l}{h} = \frac{W\,l}{27\,h}$ and the difference between these two values $\frac{W\,l}{27\,h}$ is the horizontal component of the counter-brace; its longitudinal strain is found, as before, by multiplying this value by the fraction $\frac{\text{length of diagonal}}{\text{length of panel}}$.

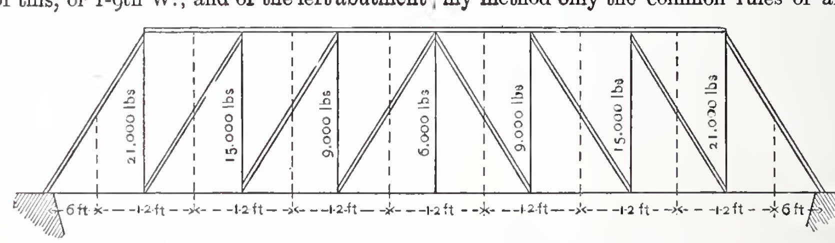
Applying this to the truss under consideration, we must remember that the dead load remains unchanged, and that we have only the live load to consider. The live load, as given by Mr. Randall, is 120 pounds per square foot, and therefore equal to $120 \times 20 \times 42 = 100{,}800$ pounds = 50.4 tons; hence $\frac{W\,l}{27\,h} = \frac{50.4 \times 42}{27 \times 4} = 19.6$ tons for the horizontal strain in the counter-brace; and to find its longitudinal value we have

$$19.6 \times \frac{14.56}{14} =$$

$$19.6 \times 1.04 = 20.384 \text{ tons.}$$



Strains in a Howe Truss.—Fig. 1.—The Truss Regarded as Two Levers, Loaded with half the Weight of the Truss and its Load.



Strains in a Howe Truss.—Fig. 2.—Strains on the Rods.

All things considered, it is sincerely to be hoped that Mr. Randall has not built the truss as he describes it, and if he has, that he will be given immediately an opportunity to radically strengthen it.

From J. R. L., *Lowell, Mass.*—I desire to ask Mr. Randall, whose article on floor trusses appeared in the March number, with regard to the construction of the posts represented by the line A B. The strength of the truss is really at the points B and E. No data is given as to construction, or whether the posts or struts are of wood or iron. From their shape in the drawing, I suppose they are of iron.

Strains in a Howe Truss.

From F. F., *Grand Island, Neb.*—I will attempt to give my method of calculating the strains in a Howe truss bridge, in answer to the correspondent who inquired in the January number. My plan is not the popular one. The method now is to use all the algebra and formulæ possible. I think this is the case with some engineers, because it looks more professional, in the same way as a physician gives his prescription in Latin and crow-tracks. The professors of mathematics in colleges like to appear as scientific as possible when explaining to each other what they know about bridge building. Accordingly, algebra and formulæ are necessary to them. According to my experience, those who use the most algebra have the least practical knowledge of the business. Not one in a thousand of the scientific men can go into a bridge-yard and, taking a square, lay out a simple brace for a piece of trestle-work, giving the correct length, without being obliged to sit down and figure it out by the rule of square root. Accordingly, your correspondent will find in my method only the common rules of arithmetic. He will not have to go beyond a simple proportion, the old rule of three so called. What I shall present is nearly all original, and has cost me considerable study to pick it out and get it from algebra down to arithmetic. It has frequently bothered me to make head or tail out of some of the published formulæ. For example, the standard formula for calculating the horizontal strain at the center of the lower chord in a truss is as follows:

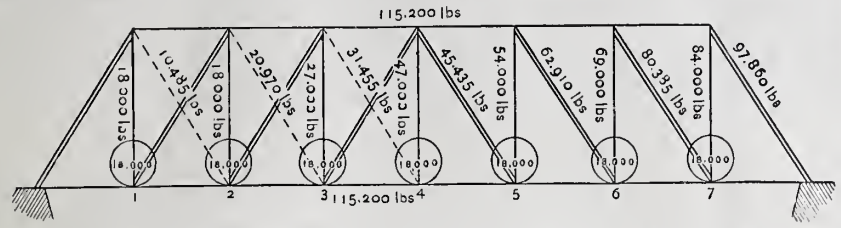
Let w = weight of bridge and its load.
s = span of bridge between supports.
h = hight of truss.

Then $\frac{w \times s}{8\,h}$ = horizontal strain at center of lower chords of bridge.

Now, if the person who proposed that formula had simply said multiply one-fourth of the weight of the bridge and its load by one-half the span, and divide this by the hight of truss, he would have told the truth and given practical men some clew by which to work to analyze the rule—excuse me, I mean formula. That "8 h" bothered me a long time to find how it came in and what relation it had to the strain.

Referring now to your correspondent's question, we will take as an example a railroad bridge of 96 feet panel lengths in span,

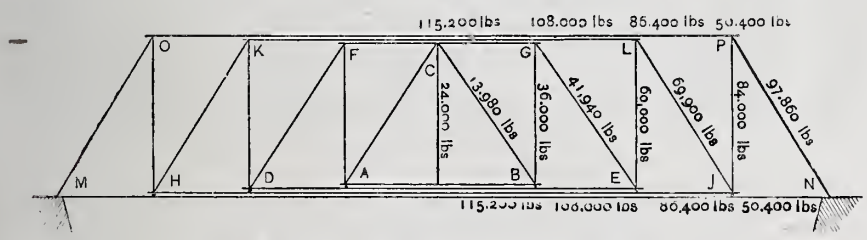
divided into 8 panels of 12 feet each. We will suppose the hight of truss to be 20 feet. We will calculate the strain for a truss weighing 1000 pounds per foot, and for a uniform load, and also a rolling load of 3000 pounds per foot, as named in the inquiry. By these conditions the total weight of bridge will be 96,000 pounds. Its load will be 288,000 pounds. Total, 384,000 pounds. For convenience in calculating and proportioning the members, we will take one side of the bridge, or one truss, at one-half these figures. This gives for the weight of truss 500 pounds per foot, or a total of 48,000 pounds. Its load will be 1500 pounds per foot, making 144,000 pounds. Total load, 2000 pounds per foot, or 192,000 pounds in the aggregate.



Strains in a Howe Truss.—Fig. 3.—Strains Caused by the Live Load.

The strains in a Howe truss bridge are: first, the strain on the chord at the center of the bridge with the bridge uniformly loaded from end to end. This is the greatest strain on the chord, and gives the data for proportioning it; second, the strains on the rods from the weight of the truss alone, which affords the data from which to calculate the strain with a rolling load added to the truss, and moved across a panel-length at a time. This gives the greatest strain on the rods and braces, and also the proportion and strain for the counterbalancing; third, the strain on the rods with the truss uniformly loaded, from which to calculate the strain on the different parts of the chord. This is useful in proportioning a chord for a combination bridge.

We will first calculate the horizontal strain at the center of the lower chord with the truss uniformly loaded from end te end. To do this, we will regard the truss as two levers, Fig. 1, each weighing one-half the weight of the truss and load (96,000 pounds) suspended at one end, and with a bent arm of a lever running down 20 feet, or equal to the hight of the truss. The question then is, What will be the strain on the link at the center which will correspond to the strain on the lower chord at the center? By the rules of leverage, this will be expressed by the proportion: as 20 feet is to 48 feet, so is 48,000 pounds (the weight at one end) to 115,200 pounds, the strain at that point. This is the greatest strain on the chord, and is at the center. The horizontal compression at the center of the upper chord is the same as the tension in the lower chord, as may be seen by turning the figure bottom up.



Strain in a Howe Truss.—Fig. 4.—Strain Diagram.

We will next calculate the strains on the rods with the weight of the truss alone. The center rod carries an amount equal to one-half a panel on either side, or 12 feet in all, which, at 500 pounds per foot, is 6000 pounds. This we will write along the rod, as shown in Fig. 2, as indicating its strain. This 6000 pounds is carried by the braces at the sides, each brace carrying one-half, or 3000 pounds. The next set of rods carry a panel and a half each side of the center, or 36 feet in all, which, at 500 pounds per foot, gives 18,000 pounds as the total for the two, or 9000 pounds at each end as the strain. The braces back of these, in turn, support the weight carried by the rods. The next set of rods carries two and a half panels each side of the center, or 60 feet in all, which, at 500 pounds per foot, gives 30,000 pounds in all, or 15,000 pounds at each end. The braces back of these, in their turn, support the weight carried by the rods. The next set of rods carries threo and one-half panels each side of the center, or 84 feet in all. This, at 500 pounds per foot, gives 42,000 pounds or 21,000 for each. The end braces support the weight in these. The remaining 6 feet at each end is carried by the abutments. As the rods are always at least in pairs, as also are the main braces, I have spoken of them as a set of rods and braces.

Having found tho strains upon the rods from the weight of the truss itself, we will next find the weights carried by them and the strain upon the braces, and also inelude the counter-bracing with a rolling load moved across the truss. In this connection it may be well to romark that bridge authorities differ in the method of making the calculation we are about to undertake. Of the three authorities at hand, one gives light counterbracing, the second is hard to tell what he would do, and the third would counter-brace if the rolling load per panel exceeded the uniform load per panel. From this it would appear that the three methods are as nearly opposite as can be. None of them agree with the Howe truss practice. Using the bridge that will give the most economical results is now the strife among bridge builders, which interpreted means the bridge that will use the least possible material and yet have enough left to swear by, is the best bridge to build by contract. The method I shall present does not give the most economical results in this sense. It is just as good theory, however, as any of them. It is safe and conforms to the Howe truss practice. In the specification it is usual for highway bridges to require the rolling load to equal the uniform load and to be shoved across the bridge a panel at a time until the bridge is covered. For a railroad bridge it is sometimes the custom to have the rolling strain represent a train of loaded cars preceded by a locomotive of heavier weight. For convenience of explanation, we will take a uniform load per panel, which would be 18,000 pounds, and we will move this across, or what is the same principal, somewhat simpler, we will load our truss and pull the load back a panel at a time and adjust the members to the weight.

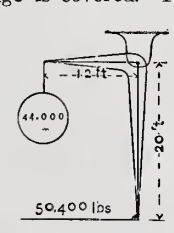


Fig. 5.—Calculating the Strain Along the Chord of the First Panel.

In Fig. 3 we have seven weights of 18,000 pounds each, numbered from 1 to 7. The whole seven weights give a total on our truss of 126,000 pounds. Rods numbers 1 and 7 have to carry this weight, each carrying one-half, or 63.000 pounds. This is the strain upon them from the effects of the load. By examining the provious figuro it will be seen that there was a strain upon them of 21,000 pounds from the weight of the truss. The two added together give 84,000 pounds as the total strain, which we will now write along the rods, as shown in Fig. 3. We will remove the load from rod No. 7, which is equal to pulling the rolling load back one panel-length. This gives us 6 weights of 18,000 pounds each, or 108,000 pounds, which is carried by rods 1 and 6, or 54,000 pounds by each. By referring to Fig. 2 again, we find that rod No. 6 had, by previous calculation, a strain of 15,000 pounds. This, added to our 54,000 pounds, gives 69,000 pounds as the total strain for it, which, as in the previous case, we will write along the rod. We will now remove the weight on No. 6, leaving 5 weights on the truss, which gives 90,000 pounds supported by rods Nos. 1 and 5, or 45,000 pounds each. Our weight from the truss on rod No. 5 was 9000 pounds, which makes a total of 54,000 pounds as the strain upon No. 5, which we also write in the diagram. Removing the weight from No. 5 leaves 4 weights, or 72,000 pounds to be carried by braces 1 and 4, or 36,000 pounds by each. The truss weight for No. 4 was 6000 pounds, which, added to the last amount, makes 42,000 pounds as the total strain for this rod. We are now at the center of the bridge, and have found the total strain on rods 7, 6, 5 and 4. Rod No. 1 will correspond with No. 7; No. 2 with No. 6, and 3 with 5. The braces back of each will have to support the weight which each set of rods carries.

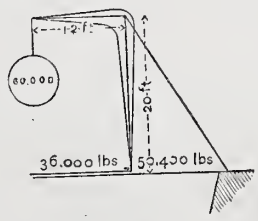


Fig. 6.—Strain in the Chord of the Second Panel.

We will next remove weight No. 4. This leaves 3 weights, or 54,000 pounds for rods 1 and 3, making 27,000 pounds for each. As we have no braces back of No. 3 to support it, we will introduce a counter-brace, as shown by the dotted lines (Fig. 3) for this purpose. As the main braces between rods 2 and 3 carry the weight of the truss, we make no addition on that account, but write 27,000 pounds as the total vertical strain on the counter-braces between rods 3 and 4. We will next remove weight No. 3, leaving 2 weights, or 36,000 pounds for rods 1 and 2, or, say, 18,000 pounds for each. It is necessary to introduce another counter-brace between rods 2 and 3 to support this weight, as shown by the dotted lines. We will now remove weight No. 2, leaving but 1 weight of 18,000 pounds on rod 1. One-half of this, or 9000 pounds, is supported by another counter-brace introduced between rods 1 and 2, and is the vertical strain on it.

Having found the strains on the rods, we will now find the strains on the braces supporting them. Vertically, the strains on the braces are the same as on the rods, but, as the braces are inclined, the strain is "as the secant of the vertical angle, radius being 1." This means that the strain is increased in the same proportion that the length of the brace is increased over the hight of the truss. In this case the length of the brace is 23.3 feet, while the hight of the truss is 20 feet, so that for our end brace we have the proportion: as 20 feet is to 23.3 feet, so is 84,000 pounds (the weight on the rods) to 97,860 pounds for the strain on that brace. In the next brace we had 69,000 pounds on the rods. By using the same proportion we find that the strain on the rods supporting it is 80,385 pounds. In the same way we ascertain that the strain for the next is 62,910 pounds. For the center rod we had 42,000 pounds, made up of 36,000 pounds as the strain from our rolling load and 6000 pounds from the weight of the truss. As the brace from the other side of

the center carries one-half the weight of the truss at this point, we need only take one-half of that amount into our calculation, which gives us 39,000 pounds as a basis upon which to figure for the brace. By the same calculation as before, this gives 45,435 pounds as the strain for this brace. For our first counter-brace, with 27,000 pouuds vertical strain, we have 31,455 pounds as its total strain. For the second counter-brace, with 18,000 pounds vertical strain, we have 20,970 pounds as its actual strain. For the end counter-brace, with 9000 pounds vertical strain going to the side of the counter-brace, we have 10,485 pounds as its actual straiu.

Our strain now coutains all the data necessary for proportioning a bridge with wooden top and bottom chords, save the strain at the ceuter of the chords, as found by our first calculation, and as illustrated in Fig. 1. By transferring those figures to the chords in the last illustration we will have all that is

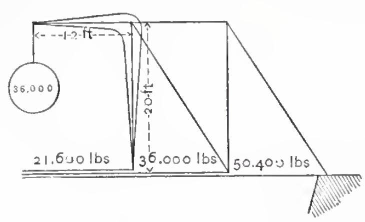


Fig. 7.—Strain in the Chord of Third Panel.

required by which to work when we come to make up our list of dimensions for the different members. Before doing this, however, we will fiud the strains on the different parts of the chord, to show the method of calculating the straius for a combination bridge. In making these calculations it is well to understand that a Howe truss is really a series of trusses supporting each other, as shown in Fig. 4, which also answers for the strain sheet. We commence with a small "A truss," indicated by A B C in the center. This we will carry with a beam truss D E F G. This, in turn, is carried with another beam truss, H I K J, which is carried by another one, L M O N. The latter is carried by the abutments. To find the strains on tho different parts of the chords we first have to find the weight on the rods with the truss uniformly loaded. This is done by the same method that we used to find the strains on them from the weight of tho truss itself. The weight of the truss was placed at 500 pounds per foot. The weight of the truss and load is 2000 pounds per foot. Without going through the calculations again, we will write in our diagram the strains on the rods as the result of that weight. To find the strain along the chord we will commence at the abutment and construct a bent lever, with ono arm 12 feet long, equal to the length of the panel (Fig. 5.) We will make the other arm, 20 feet long, equal to the length of the truss, and will then hang a weight of 84,000 pounds, corresponding to the weight carried by the end rods, and see what the pull is along the chord attached to the long arm. By the rule of leverage already referred to, we have the proportion: as 20 feet is to 12 feet, so is 84,000

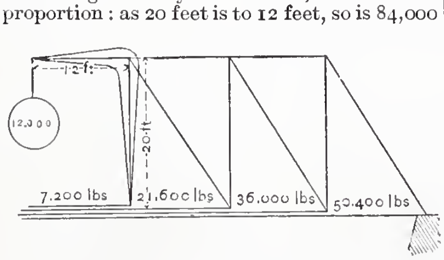


Fig. 8.—Strain in the Chord of Fourth Panel.

pounds to 54,000 pounds, which is the pull or strain along the lower chord from the abutmeut to the first set of rods. We will now take the next set of rods, which carry 60,000 pounds, and applying our bent lever as before, with the weight just named attached, as shown in Fig. 6, we find in the same way that the strain from this along the lower chord in this panel is 36,000 pounds. For the next panel we use the bent lever again, with a 36,000-pound weight, as indicated in Fig. 7, which is the weight for the next set of rods, and gives a strain of 21,600 pounds along the chord, as indicated. We now come to the pauel next the center. As the total strain on the center set of rods was 24,000 pounds for both sets, only one-half, or 12,000 pounds, belongs to the sides we are working from. Tho weight used for this, however, is 12,000 pounds, which, arranged as shown in Fig. 8, gives 7200 pounds as the strain along this panel. As the chord is constructod, it is practically one piece of timber or iron. The chord, therefore, in each panel from the abutment has

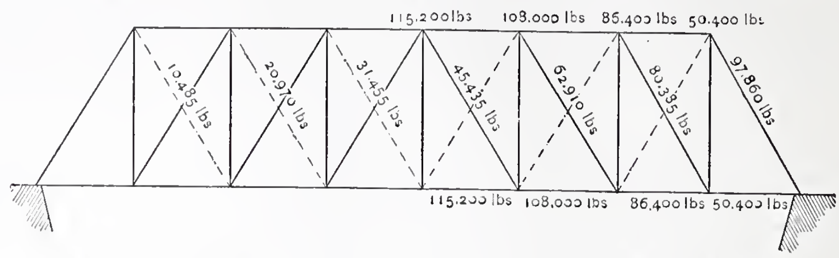


Fig. 9.—Arranging the Accumulated Strains on the Different Members.

to take successively, not only its own strain, but in addition all the strains of the other panels reaching back to the abutment. Thus we have in the first panel 50,400 pounds (Fig. 8.) In the second panel we have 36,000 pounds, to which, if we add the 50,400 pounds, makes 86,400 pounds as the total strain in the second panel. For the third panel we had 21,600 pounds, to which add 36,000 pounds in the second, and 50,400 pounds in the first case, which gives 108,000 pounds for the chord strain in it. For the fourth panel we had 7200 pounds, to which add 21,600 pounds in the third, 36,000 pounds in the second, and 50,400 pounds in the first, gives 115,200 pounds as the total for the fourth panel. By referring back to our first diagram, which was made to find the horizontal strain at the center of the lower chord, we find that this corresponds with those figures and proves our calculations correct. As will be seen after calculating the brace strains, this rule gives much lighter strains for the rods and braces than our first method of finding the greatest straiu on them by using a rolling load. Add to this last strain sheet by any rule that will give light counter-bracing for one or two panels each side of the center, and we have what is frequently given as a strain sheet.

Having found the straius in all the different members, we will now arrange our greatest

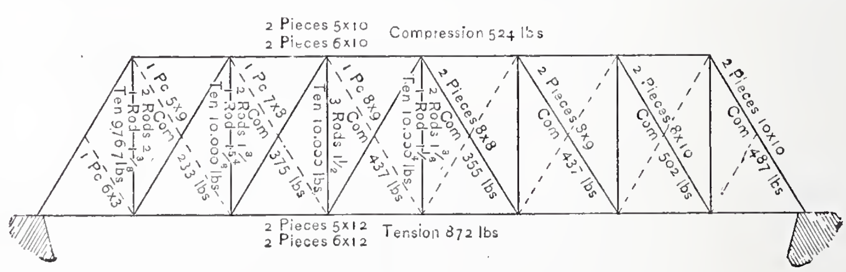


Fig. 10—Dimensions of Members in Accordance with Strains.

strains on the different members, and proportion the bridge to them. From our lower chord we will use two pieces of 5 by 12 outside, and two pieces 6 by 12 iu the middle, packed 1 inch apart, giving us a chord 25 inches wide. Allowing for 1 inch cut away in our outside timber by tubes for angle block and clamps, and 1 inch at the top for dadoes, and 1 inch cut away on each side of the middle timber, for the same purpose, gives us an area of solid timber in each of 4 by 11, or 44 square inches. As one splice will come in each panel, we will only count for three chord sticks, or 132 square inches, giving, with 115,200 pounds at the center, a tensile strain of 872 pounds per square inch of section. For our top chord we will use two pieces of 5 by 10 outside, and two of 6 by 10 for the middle. For these we will use the whole end area, as the sticks abut together, and the portions cut away for angle block tubes and packing blocks have a bearing against them. These figures give an area of 220 square inches, and a compressive strain at the center of 524 pounds per square inch of section. For the end braces we will use two pieces of 10 by 10, or 200 square inches of section, which, sustaining 97,860 pounds, gives 489 pounds per square inch of compression. For a cripple counter-brace (as much for the looks as anything) we will use a 6 by 8, boxed to fill out our 10 by 10 to the width of the chord, and to serve as a packing block between braces. For our next brace we will use two pieces of 8 by 10, with a 5 by 9 counter to fill out to the 25 inches width of chord. For our braces we have 160 square inches area, and a strain of 80,385 pounds, giving 502 pounds per square inch of compression. For our counters we have 5 by 9 inches, or 45 square inches area, with a strain of 10,485 pounds, which gives 233 pounds per square inch of compression. For the next braces we will use two pieces of 8 by 9, with a 7 by 9 counter-brace to fill out. This will give for our main braces 144 square inches, with a strain of 62,910 pounds, making 437 pouuds per square inch of compression. Our counter has 56 square inches for a strain of 20,970 pounds, giving a compressiou of 375 pounds per square inch. For the center brace we will use two pieces of 8 by 8, and a counter 8 by 9. This gives for our main braces 128 square inches area for 45,435 pounds strain, or 355 pounds compression per square inch. The counter has 72 square inches arca, aud a strain of 31,455 pounds, makiug 437 pounds per square inch of compression. As the braces are arranged, we will require for our end braces half blocks of 10-inch face. For the angle blocks we can use one pattern with one 8-inch face for all.

For the end rods we will use two of 2-inch diameter and one of 1¾-inch diameter, with upset ends. The total area of rods will then be 8.6 inches, giving for our strain of 84,000 pounds, a tensile strain of 9767 pounds per square inch of section. For the second set of rods sustaining 69,000 pounds strain, we will use two rods of 1¾-inch diameter and one of 1⅝-inch diameter, with upset ends. The total area is 6.9 inches, giving 10,000 pounds per square inch of tension. For the next set we will use three rods of 1½-inch diameter, with upset ends, giving 5.4 square inches area with 54,000 pounds strain, gives 10,000 pounds per square inch of tension. For our center rods we will use two rods of 1⅜-inch diameter and one rod 1¼ inch in diameter, with upset ends, giving 4.2 square inches, which, with 42,000 pounds strain, gives for them 10,000 pounds per square inch of tension.

We have now all our members figured out and proportioned. Let us now give attention to the rules for finding the camber. The camber in a bridge is given by making the upper chords a trifle longer than the lower ones. The panels in a bridge correspond to the ringstoue of a segmental arch. The rise in the arch corresponds with the camber in a bridge. A common rule with some bridge carpenters is to make the upper chord as much longer thau the lower chord as the desired camber and divide this amoug the panels. This rule is only correct when the

hight of the truss is equal to ⅛th of the span. A good table for finding the camber which I have used, is from Trautwine's book and is as follows: Multiply the desired camber in inches by the following members: When the hight is one-fourth of the span multiply by 2.00, for hight one-fifth of the span multiply by 1.60, for one-sixth by 1.33, for one-seventh by 1.15, for one-eighth by 1.00, for one-ninth by 0.88, for one-tenth by 0.8, for one-eleventh by 0.73, and for one-twelfth by 0.67.

As the hight in the bridge we are figuring is nearly one-fourth of the span, we will use as a multiplier 2.00. This, for 3 inches camber gives 6 inches additional length required in the upper chord. This, divided between eight panels, gives ¾ths of an inch for each panel, so that our lower chord panels will be spaced 12 feet, and our upper chord panels 12 feet and ¾ths of an inch.

For the flooring system in this bridge I will present a rule that was taken from *The Scientific American* a few years since, and which I have tested in the construction of several bridges. The rule is, multiply the square of the depth of the beam in inches by the breadth in inches, and divide this by the length between supports in feet. Multiply this by 90, which will give the safe load for a pine beam at the center for first-class timber. In the example we have been figuring the load is 3000 pounds per foot bridge, with panels of 12 feet. This gives us 36,000 pounds load per panel. With six floor beams per panel, that is, placing them 2 feet from center to center, we have 6000 pounds load for each beam to carry, in addition to its own weight, and the track-stringers, ties and rails. For this we will allow 400 pounds more, making a total of 6400 pounds for each beam. For 14 feet between chords of the bridge we will try a beam 7 by 12. The square of 12 is 144. This, multiplied by 7, gives 1008. This, divided by 14, gives 72, which, multiplied by the constant 90, gives 6480 as the safe load at the center of the beam. As our track-stringers and consequent load is not at the center, but about one-third the distance from the center to the side of the bridge, we get one-third additional to the above as the safe load, but since stiffness to prevent springing is an item to take into account, our one-third additional above actual capacity is none too much allowance to make, so that, we will take for our floor beams six pieces of 7 by 14 in each panel. In this connection, I would remark that in calculating oak the constant in the above rule becomes 120 instead of 90. As the track-stringers have a bearing every 2 feet in their length, no calculations are necessary. We have now made all the calculations required for a Howe truss bridge, except, perhaps, the lateral bracing, which is not considered necessary.

I trust I have answered your correspondent's question in an acceptable manner. In conclusion, I will say that a great want at present felt is a practical bridge book, small enough to be carried in the pocket or kept in a tool chest, and adapted particularly to the wants of bridge carpenters. It should give hints about the use of the square in laying out work, suggestions and rules about traeing, also calculations and explanations in plain English, without algebraic formulæ, for the planning and construetion of different kinds of trusses. It should give particular attention to those intended for highway bridges from 40 to 100 feet span, and should contain useful information generally with regard to everything pertaining to this kind of work, whether it be for railroads or highways. Such a book, say one like Tower's, somewhat enlarged and fully illustrated, would, I think, find a ready sale among bridge men. What is more, although perhaps it is better not to say it aloud, there are a great many of us employed in the engineering department who would like to become the owner of just such a book for every-day use.

Note.—Possibly some of our readers who are bridge engineers will feel disposed to criticise F. F.'s method, here so carefully presented. While his communication in the main is of undoubted interest to a large class of readers, there are some important omissions, and possibly some false conclusions, to which their attention should be called, and which it may be the pleasant opportunity of other correspondents to point out. We realize that it is popular among practical men, at the present day, to scoff at algebraic expressions and all kinds of formulæ. Those whose education has not been such as to render them entirely familiar with the use of the formula fail to appreciate its convenience. When formula comes to be recognized as a condensed record of experience, there will be less disposition to avoid it than at present. Every competent mechanic is eager to possess improved tools, and upon this principle each should be eager to become acquainted with the best methods of expressions and the best means of recording rules and results. The first few pages of any school-book on algebra, once carefully read, will make the intelligent student familiar with the method of algebraic notation in general use. This point gained would soon lead him to welcome the formula as a great relief from long and tedious arithmetical operations. We have not space to enlarge upon this subject, nor to enter into detailed criticisms of this letter. There are one or two points, however, to which we shall call attention in passing. Referring to the formula $\frac{w \times s}{8\,h}$ of which our correspondent speaks at the outset, we would say that it is an apt illustration of what we have remarked above. The rule which he substitutes occupies five lines and really explains nothing. Further, it is in error. The bridge engineer does not "multiply one-fourth of the weight of the bridge and its load by one-half of the span, . &c." He uses one-fourth of the weight of the truss, and its share of the bridge load. For example, in a double-tracked bridge with three trusses, the outside ones each carry one-fourth of the load, while the center one carries one-half of the load of the bridge.

While this correspondent objects to mathematical expressions, he does not scruple to use them himself. Speaking of the strains in the inclined braces, our readers will notice the following language: "The strain is as the secant of the vertical angle, radius being 1." It will seem to the casual reader that this is a very abrupt plunge into the intricacies of trigonometry. Concerning the suggestion at the close of the letter for some one to write a practical treatise small enough to be carried in the pocket or kept in a tool chest, we believe that this correspondent is well prepared to get up just such a work. He evidently understands the subject from the practical side; but such a book could not contain the necessary directions without employing algebraic formulæ, unless it was extended to undue proportions.

What Mechanics Read.

From G. C. W., *Lockport, N. Y.*—In the March number a correspondent says that he is astonished at the statement of Mr. Robert Riddell, that 95 per cent. of the mechanics of this country are regular patrons of dime novels and the light literature now so generally published. If the 95 per cent. represented real mechanics he would have cause for his feelings, but the facts of the case are that the 95 per cent. are not mechanics. Five per cent. may be mechanics, but the others are not deserving the name. The 5 per cent. stow away more sound sense in one evening's reading than the 95 per cent. are capable of mastering in a month. Here is a specimen of one of the 95 per cent. fellows, taken from Chordal's letters. He says: * * * * I was in the office of a certain engineer the other day, and a mutton-headed boy, about 19 years of age, came in. He was a machinist. His father owned a shop and he had served his time in it. He wanted to learn to "draft," he said. Said his father wanted him to learn; he wanted to learn himself, and his father would pay all reasonable bills. Torsion, the engineer, began to chatechize him. "What have you ever drawn?" "Nothing." "What have you ever wanted to draw?" "Nothing." "What have you ever made rude sketches of?" "Don't know as I ever wanted to draw anything, and could not make a 'draft' if I wanted to, because I never learned how." "That's all right," said Torsion, "You will never draft anything, and will never be wanted to. I'll see your father this week." Torsion turned to me and said he had a dozen such fellows to deal with every month, and treated them all the same. "But," said he, "when some greasy boy slips in here and pulls out some horribly original drawing, and asks me why the ink lines run when he puts color on, or how a fellow's to judge good India ink, or how this thing is to be drawn so another can understand it, then I quit work, and stay by that fellow, and place my time and library and office at his disposal."

Cheap Frame House.

From G. A. C., *Brooklyn Village, N. Y.*—In the specification of Mr. Elias Ayars's cheap frame house, it calls for an 8-inch brick foundation. It seems to me that is a very poor plan to start with, for the action of frost affects brick, causing it to crumble in a few years' use. Sills 3 by 6 inches are a defect in planning, as sills so light as that are liable to settle with any setting of the walls. Posts 4 by 6 inches are unnecessary Door posts 3 by 4 inches are not as good as 2 by 4 doubled. If I should go to a lumber yard and inquire for 3 by 6, 3 by 4 and 3 by 8 stuff, also for beaded pine strips, I think I should have to explain myself, and therefore I raise the question what the architect means by beaded pine strips. To use Southern pine we should have to hold an awning over the floor, in order to keep the sun from trying out the pitch.

From J. R. L., *Lowell, Mass.*—Referring to the cheap frame house, the design of which was submitted by Elias Ayars, of Hornellsville, N. Y., some time since, I would say that if I have scaled the plan correctly, the landing of the chamber stairs is but 2½ feet wide. The door to each chamber is but 2 feet wide. That is all right for those who want such doors, but the trouble is, how will more than a 5½-foot door swing in that place or be possible to put there? According to the scale it is but 5½ feet from the chamber floor to the slant of the roof, as given in the detail. I ask this, not in the spirit of criticism, but for information.

From J. T., *Ashton, Cass Co., Mo.*—Since there is so much discussion with regard to the cheap frame house published in the December number of the paper, it may be of interest to state that twelve years ago I put up the brickwork of a house to the same identical plan. The rooms were 2 feet larger, and there was a cellar under the main part of the house. The brickwork, plastering and stonework cost upward of $700. This shows that the plan is not original. The house in question was built for Mr. James N. Fisher of Rosendale, Kansas, who now occupies it.

From A. M., *Baltimore.*—I have carefully perused the estimates from several correspondents on Mr. Elias Ayars's cheap house, also the revised estimate from Mr. Ayars himself, but not one of them says a word about plastering. I would like to know who is to do the plastering on this house. Perhaps plastering is entirely omitted in cheap houses in the Northwest,

Use and Management of Ropes.

From D. P. M., *Hamilton, Mo.*—The series of articles entitled "Management and Use of Ropes," is something we inland people have felt the need of more times than once. The articles have been very acceptable indeed.

From J. C. R., *Carthage, Ohio.*—I have been very much interested in the articles on ropes and knots. I may be tempted to give something in the way of knots myself, in the manner which I was taught when quite young. This subject is of great usefulness to all. I have frequently made extra money, after my day's work was done, by splicing ropes. I can splice my chalk-line so neatly that it is hard to find the place. I can chalk over it without chipping the chalk.

Note.—We trust this correspondent, and others of our readers who can contribute further in the matter of ropes and splices and knots, will favor us with their letters.

Camber in a Howe Truss.

From R. H., *De Soto, Mo.*—The camber in a Howe truss is simply a flat segment of a circle. Suppose, for example, a bridge of twelve panels, not including the post panels that rest upon the abutment, is to be built. Suppose that the panels are each 12 feet from center to center of the casting, or 144 feet long total. Lay off on the panel rod, on one edge, 12 feet for the bottom chord; square across and on the flat edge add 3-16ths of an inch to each end of panel, which would be ⅜ of an inch longer for the top chord. But, applying this length by the number of panels, it will be seen that the top chord is 4½ inches longer than the lower chord, which is the amount of camber when screwed up. The braces and counters are all cut to one length by one pattern, and are perfectly square on the ends. If the panels are 10 feet in length, ¼ of an inch is plenty to add to the panel for the top chord.

From H. F. A., *Bangor, Me.*—I think H. McG. is mistaken in the method he mentions. We get the camber in a Howe truss by simply making the length of the panel in the top chord ⅜ to ⅝ inch longer than in the bottom chord. All the braces are cut the same length. In a truss 150 feet span, 20 feet high, having 14 panels, making the panels in the top chord ½ inch longer than those in the bottom chord, will give a camber of about 6½ inches.

From NORTHWESTER, *Springfield, Mo.*—I was greatly pleased in the January number to see some inquiries with regard to the Howe truss. Such questions are at least a relief from the hopper bevel and slide-rule conundrums, which, for a long time, seem to have monopolized our technical building journals. I was, however, somewhat disappointed in the February number to see only one reply, and that one erroneous in its conclusions. The March number is silent on the subject. The camber is gained almost universally nowadays by making the panels of the top chord slightly longer than the panels of the bottom chord. The amount of increase varies in the varying sizes and proportions of different spans. H. McG.'s method of varying the lengths of braces may have been in use at some time or other, but certainly it is obsolete now. At the present time every brace and counter-brace in the bridge is calculated to measure the same length from panel point to panel point, excepting, of course, the end counters, which are shortened enough to make the end posts plumb. The only difference in the lengths of braces is made on account of having angle blocks of different sizes for the larger and smaller braces. The difference in the braces is the same as the difference in the angle blocks.

S. P. J. will do well to consult text books for the information he wants. It is certainly more than any one would feel justified in writing out and sending to a periodical for publication.

Policy of the Paper.

From J. L. F., *Milan, Ohio.*—I believe that the Editor of *Carpentry and Building* is working in good faith to the best interests of the largest number of the subscribers to the paper. I believe that in his selection of articles for the paper, and in his general management of it, he is doing everything that could be expected, and is giving his readers entire satisfaction. With all this said, however, I think that the Correspondence Department of *Carpentry and Building* is the stronghold of the journal. By the letters which are published in it we are enabled, as we could be in no other way, to know the minds of mechanics all over the country. The readers do not wish to take the Editor's word for everything, no matter how well-informed he may be, or how correct his conclusions are. We want other opinions on the subjects raised. We want to hear from fellow-mechanics who have experimented in the same way in which we are working. We are always glad to read the Editor's remarks, or his comments upon the letters published. What he says adds additional value to what is written by the contributors, but as I have already said, the great advantage of this paper for men in our trade is that it presents the opinions of the craft on the various subjects discussed. I therefore give my hearty indorsement to the present policy of the paper, and desire to say that I am opposed to the changes suggested by the Toronto correspondent. Should the Editor follow out this suggestion the paper would lose much of its interest for me and many with whom I am acquainted. Our attachment to *Carpentry and Building* is based upon the "simplicity with which it treats commonplace subjects." We do not want the efforts of one man to fill all its pages when it is possible to have something from each of fifty minds.

From B., *Camden, Ohio.*—I should like to say a word or two for the benefit of A. W. W., of Toronto. The carpenters in this part of the country do not incline to hero-worship, even though the hero be no less a personage than the Editor of *Carpentry and Building*. We are much better satisfied to learn the ideas of practical men in all parts of the country than we could be with the writing of any one man, however well versed in the craft. We trust we are not surpassed even by Toronto carpenters in our respect for the Editor of the paper.

From F. L. L., *London, Ont.*—With others I read the communication in the March number, from A. W. W., of Toronto, in which fault is found with the conduct of *Carpentry and Building*. As regards keeping strictly to what will benefit the journeyman carpenter, I agree with this correspondent, but when he talks about correspondence, and says he does not want to be talked to by untrained men, but by the Editor alone, I think there must be something wrong with him. I, for one, consider the exchange of working views of the best men of the trade, which is a feature of the Correspondence Department, to be something very valuable, and, therefore, I entertain very different opinions from your Toronto correspondent. I consider the Correspondence Department the very best part of the paper. The subjects on which A. W. W. desires to be enlightened are those applying particularly to architects, and are treated thoroughly in architectural publications. I sincerely hope, for the benefit of myself and fellow-workmen, that it is not to a republication of matter of this kind that the paper is to be devoted. The usefulness of the paper is in its helping journeymen and leading them upward in their trade. I shall always read the paper as long as I work at the trade, and so long as it continues upon the policy upon which it is at present conducted.

From W. B., *Springfield, Mass.*—I will take back everything that I have said in *Carpentry and Building*. You may return all the shingles to me. Send them all back. I didn't know that I was an amateur until I read E. C. B.'s letter, but if the dear, good readers of *Carpentry and Building* will forgive me this time, I will never be one again. I cannot even think of a story that will illustrate the feelings of W. B.

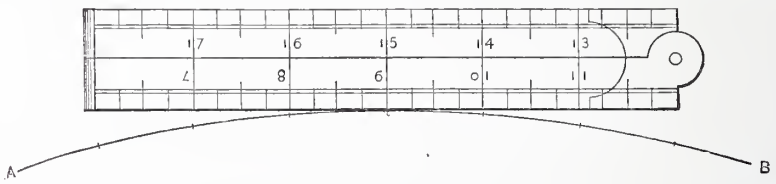
From A. W. W., *Toronto.*—I trust the Editor will allow me very briefly to reply to E. C. B., who, in uncalled-for language, takes me to task for presuming to offer candid opinions on the policy of *Carpentry and Building*. Most of what this correspondent says is wide of the mark, though it is undoubtedly clever. What I said before I repeat, "The information is seldom of a sufficiently practical character to be really useful to the young or to the experienced carpenter." This your correspondent ridicules, but does not answer. He says that I and my friends in the trade want "information about gothic framing, stairbuilding, &c." So we do. I have read the paper regularly since 1880, but I have not found therein the information specified. I like *Carpentry and Building* or I should not read it, much less buy it. If I think too much space is devoted to architects' plans and too little to practical details of carpenter work, why should I not express an opinion?

Every carpenter and builder knows what a great variety of information can be offered that would be of real service to him. That is what I tried to suggest in my letter. For example, details of shop and store fronts, office fitting, foliated tracery, the construction of mansard and other roofs, are subjects which, if treated in the proper manner, would be of inestimable value to the trade at large. I believe in encouraging amateurs in seeking information for themselves, but I do not want amateurs to teach me. Of course, if E. C. B. thinks that I called him an amateur, it is he and not I who puts the cap upon him. Although I prefer not to adopt his plan of soaking my head in a barrel of shavings, I thank him kindly for giving the result of his own experience in that direction. I should not put the Editor's note in my pipe and smoke it, for that would be a poor compliment to him. Indeed, E. C. B.'s suggestion is not particularly civil to the Editor.

Note.—In discussing the policy of the paper, all sides are entitled to a hearing, and if this correspondent was misunderstood in the first instance, it is his due that space be given to his explanation.

Kerfing.

From W. T. C., *New York.*—Please let me add my mite to the information on the subject of kerfing, which has recently received attention in *Carpentry and Building*. To find the distance from cut to cut, lay your rule on the edge of circle, as shown in the accompanying sketch. The distance will be got exactly correct. As to thickness of saw, each man must use his ordinary knowledge in determining this point. If the molding is to be bent about a large circle, a thick saw should be employed. If the circle is small, a very thin saw should be used.



W. T. C.'s Method of Spacing Saw Kerfs for Bending a Molding.—Half Full Size.

The Ten House Plans.

From P. F. D., *Fairport, N. Y.*—I find that the house plans published in the February number are a matter of much thought and talk among the craft generally. Without an exception, this number is considered worth many times the price of a year's subscription. In my judgment there is one serious objection to all the plans presented, and so far I have not found anyone who has disagreed with me. The absence of a sleeping-room on the first floor is a great oversight in planning a house. For the comfort of the aged, and for convenience in sickness, how can such a room be dispensed with?

From R. V. B., *Evanstown, Wyoming.*—If admissible, I would suggest to the readers of *Carpentry and Building* a discussion of the merits and demerits of house plans Nos. 91 and 69, published in the February number, and to which were awarded, by popular vote, the second and third prizes respectively. No. 69 was my favorite of the ten sets, and as yet I see no reason for changing my mind. I challenge any one who voted for the former to a discussion of the merits and demerits of the two sets of plans.

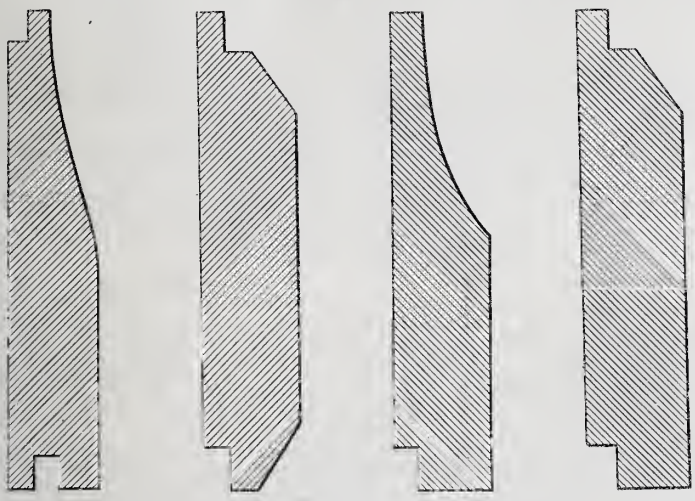
Note.—We cannot see how anything but good can come out of a friendly discussion of house plans in the manner proposed by our correspondent, and, therefore, limiting the space to, say, forty lines for each one taking part in the discussion, we invite letters from all who feel inclined to write upon this subject. The discussion must be confined to the merits of the case, and no personalities are to be indulged in.

Farm Houses.

From B. S. H., *Cooksville, Wis.*—The floor plans presented in the February number were most admirable. The efforts made by *Carpentry and Building* in the direction of a better class of suburban residences must be appreciated by those situated in a manner to make use of them. There is another class of people in the community, however, more numerous, which should have convenient and commodious houses, and which as yet has received received very little attention. I refer to the farmers. Architects, if they ever bend themselves in this direction, get up something entirely too elaborate, and so fail of the object sought. I find from an experience of many years as a builder in villages, and for the farmers, that a dwelling to suit the one must be quite different in construction and details from the other, and yet the farmer's wife should have her house just as convenient for doing her work as the tradesman's wife. In fact, she should have it even more convenient, because, in many cases, she has the work to do alone. In a paper prepared for our State Agricultural Society, three years ago, and later in "Model Farms, and their Methods," I pointed out some of these defects, and suggested, in "Comforts and Conveniences of Farmers' Homes," some needed improvements. These suggestions have called out quite an extended correspondence. I suggest that *Carpentry and Building* cannot afford to neglect this numerous class, who very generally have ill-constructed dwellings. Perhaps it might not pay, save as it would improve American homes.

Saw Benches.

From R. A. B., *East Providence, R. I.*—I was quite interested in the description A. A. F. gave of his saw benches. Perhaps some of the readers of the paper would like to try a plan which I have in use. My saw bench is made somewhat differently from those in common use. The slant of the legs is nearly all on one side. My braces are put on inside of the legs and project out over the slanting legs, as indicated in the sketch. I board the under side of the braces with ⅜-inch matched stuff, and allow the ends of the braces to project ⅜ of an inch beyond the back board, and on these ends I nail another narrow strip, with leaves between the back board and the strip a place in which to carry saws. If I am engaged in casing doors and windows, I put such tools as I shall need for work in the box. When I have one door done and am ready to move to the next, I take my horse and tools all at once, without the necessity of going back and forth for the tools. If I am hanging doors I take the door, if fitting it, and set it on edge against the front of my house. My tools are all at hand. I have used a saw-horse of this kind for nearly three years, and I should hardly know how to go about finishing without it. I have some small compartments for nails and screws across one end.



Design of Saw Bench, Contributed by R. A. B.

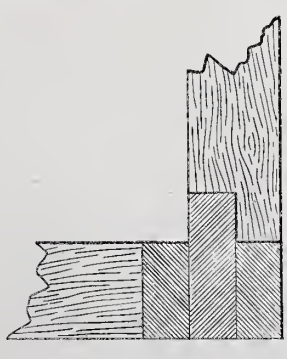
Sections of Novelty Siding.

From G. E., *Richburg, N. Y.*—If I mistake not, the inquiry of W. C. D., published in the September number last year, has not yet been answered. Accordingly I inclose you some sections of novelty siding, which may be of interest to him and other readers of the paper. Novelty siding is made about ⅞ths of an inch thick and from 4 to 6 inches wide. It is made with tongue and groove, or with rabbet. The latter, however, is to be preferred. The cove can be of any pattern fancied. Door and window casings are usually set over the siding, although it is sometimes put on like ordinary lap siding. Two men will put on from eight to ten squares per day and build scaffolds.

Designs of Novelty Siding, Contributed by G. E.

Corners of Frame Buildings.

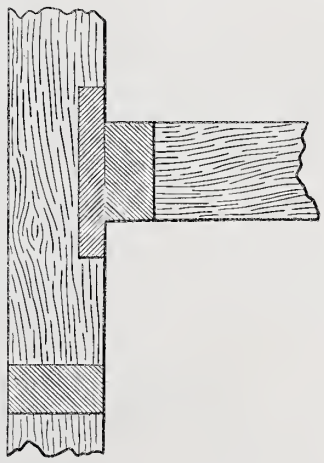
From A. S., *Davenport, Iowa.*—In a recent issue of *Carpentry and Building* there was published a sketch from H. L. B., of Grand Ledge, Mich., showing a plan used by him for making corners for frame buildings. I think his method very good, but it seems to involve too much time. I inclose a sketch of my way of making corners and partition angles in frame buildings. In the corners I use two 2 by 4 studs and one 2 by 6 between them, as shown in Fig. 1. This forms an angle for receiving the lath, and the parts, when well spiked together, make a solid corner. For partitions I use a 1-inch board nailed on the back of the angle stud, as shown in Fig. 2.



Corners of Frame Buildings.—Fig. 1.—Construction of an Outside Angle.

Carpenters' Benches.

From A. A. F., *Cleveland, Ohio.*—My letter in the March number of *Carpentry and Building* related to saw benches. What I there said will apply equally well to the work-bench. In too many cases poor, old, rickety concerns with the top all split and warped up, the sides standing at any angle from a plumb line, the legs tottering and the whole affair unworkmanlike, are employed; and such vises as are frequently met with I will not attempt to describe. Many bosses expect a man to do good work, and lots of it, upon what he pleases to call a work-bench. He would not feel able to afford the lumber or time to make a decent bench. I claim that in order to do good work a man must have a good bench in all its parts. The top should be straight and level the sides should be plumb, and a vise should be provided which shall work as perfectly as possible. The boss, in turn, should see to it that his benches are not abused. I was once taken to task for drawing the edge of a plain bit across the edge of the bench to take off the feather edge after sharpening it. The boss said he thought as much of his benches as of any tool in the shop. Experience has shown me that he was right. A bench knife should be used for holding the work down. Nails should never be employed for this purpose, for they will soon spoil any bench. A bench-dog or hook is of great importance. The best is the cheapest. I am using one that cost me a dollar ten years ago, and I would not sell it now for ten dollars, if I could not replace it. Its construction is such that it may be raised to any hight desired, or it may be sunk flush to the top of the bench by simply turning a button with the thumb and fitting.



Corners of Frame Buildings —Fig. 2.—Construction of Partitions.

A few words about the bench-pin. The pin, apparently, is a small affair, but it amounts to considerable in a day's work when rightly considered. I have worked on many a bench in which the man who made it bored a hole or two for sticking a pin in as required by his present needs. The next man wanted a pin at another place and bored a hole to suit his requirements, and, of course, used a different-sized bit. Each man who used the bench improved upon it in this manner until a dozen different holes were bored and no two of them, perhaps, were alike. This plan might work better if a drawer was provided in the bench in which an assortment of pins should be kept, corresponding with the holes bored, and each one numbered to identify it with the hole it would fit. When I make a work-bench I do not consider it done or ready to begin work upon until I have made rows of holes about 2 feet apart, commencing at the vise and extending to the extreme end. The holes are placed about 2 inches apart in the rows and are all made with one bit. I do not bore exactly horizontally, but I point the bit downward about 15°. I make the pin smooth, round and tapering from end to end. With such a pin placed in a hole bored angling, the board to be worked cannot spring off the bench nor can the pin by any possibility work out.

REFERRED TO OUR READERS.

Spanish Cedar.

From J. R. S., *Kingston, N. Y.*—Can some of the readers of *Carpentry and Building* furnish a good recipe for staining basswood or white cedar (poplar) to imitate Spanish cedar?

Striking Elliptical Arches.

From H. D., *Boston.*—Will some of the readers of *Carpentry and Building* give the most simple method with which they are acquainted of striking elliptical arches where nothing but the base line is given? I frequently am required to lay down lines of this kind, and I desire to learn the best rule for the purpose.

Hanging Wall Paper.

From T. M. B., *Portland, Ind.*—Will some of the many readers of the paper tell me how to mix the paste and hang wall paper on a plastered wall? The wall in question has had a plaster-of-paris finish.

Box Window Frames for Weights.

From J. H. H., *Bel Green, Alabama.*—Will some reader of the paper give full descriptions and illustration of the method of making box window-frames for weights? Weights have seldom been used in this country, and consequently there are very few workmen here who know anything about them. The information would be very acceptable to a considerable class of your readers.

Cabinet-Maker's Bench.

From A. H. W. G., *Halifax, N. S.*—Will some of the subscribers to *Carpentry and Building* kindly furnish me with a working sketch of a good cabinet-maker's bench, which also might be used for carpenter's work? I desire a bench to be portable and for amateur work mostly.

Sketch for a Carpenter Shop.

From A. H. W. G., *Halifax, N. S.*—Will some subscriber to the paper furnish a sketch of a carpenter shop having room for six benches? I desire the best possible arrangement for convenient work.

STRAY CHIPS.

A CO-OPERATIVE scheme of building, at present quite popular in New York, is familiarly known as the Hubert Home Clubs. By the plan upon which these clubs are organized and conducted, each individual owns his own apartments the same as he would own his own lot and house in a country village. The houses built under this scheme are of the general character known as flats or apartment houses. While ownership is unquestionable, the terms of organization are such that an apartment in a given house cannot be sold or leased without the consent of the other joint owners, thus making it impossible for objectionable tenants to mar the harmony of an otherwise well-assorted community. These flats are what may be termed centralized homes. The parent club is only two years old, but some seven different buildings have been erected since undertaken upon the same general scheme. To show the amount of money that is being invested upon this plan, it may be remarked that the seven buildings cost upward of $4,600,000, and that, including the land upon which they stand, the total investment is upward of $7,000,000. With one exception, all the buildings erected are fire-proof.

AMONG THE important buildings to be erected in Denver, Col., during the present season may be mentioned the Longfellow School, to designs prepared by Robert S. Roeschlaub, architect, to cost about $35,000; round house and shops for the D. & N. O. Railroad to cost $28,000; a business block, the property of Mr. Rodney Curtis, to plans prepared by L. Cutshaw, architect, costing $23,000. W. J. Edbrooke, architect, has prepared plans for a new Jewish synagogue to cost $25,000.

THE MARKED ACTIVITY which for twelve months past has characterized the real estate market in New York city still continues. The daily record of real estate transfers shows large and steadily increasing transactions. The process of demolishing old houses to make way for new structures is going on all over the city, while the building district up town is being rapidly covered with brick and mortar. From present appearances, more buildings will be erected in New York during this spring and the coming summer than during any previous season, not excepting that just passed. Apartment houses are attracting great attention, and are much in demand. There is, perhaps, no species of real estate in this city which pays a greater return on the amount of capital invested than the better class of apartment houses. There are none, certainly, which rent so rapidly, even in the most depressed times.

FOUR BUSINESS ROOMS, costing $10,000; a business block, costing $7000, and an addition to the County Infirmary, costing $10,000, are some of the items of the building business in prospect at Cambridge, Ohio. The plans for all these improvements are in charge of Mr. J. W. Yost, of Columbus.

AN ASSOCIATION was organized in this city on April 10, under the name of the Building Material Exchange. The signers of the articles of incorporation, 160 in number, were mostly seceders from the Mechanics' and Traders' Exchange, and applicants to that institution who declined to pay the high rate of admission demanded. The rate of admission in the Mechanics' and Traders' Exchange was formerly $25, but has been advanced to $100. Mr. Hiram Snyder was elected president of the new association. Rooms have been secured at 12 Dey street, and the Exchange will begin business May 1.

A CORRESPONDENT calls our attention to an error in a statement made in a recent number concerning the amount of building done in Denver during the year 1881. The gross amount expended upon building in that city during last year was $4,739,133, a very much larger sum than was stated in our report. The permits issued in Denver for building for the season of 1882 aggregate $608,442 for the three months ending April 1.

THE CARE with which architects and builders and real-estate owners sometimes get up pamphlets describing the property which they have in the market for sale, is somewhat remarkable. We have recently received a pamphlet from W. A. Hankinson, 213 West Thirty-first street, this city, that is an example in point. Original plates have been prepared for the cover, and it is a model in point of typography, paper and presswork. Some fine houses are described, and the pamphlet is one which would not appear out of place in any well-ordered library. This idea was undoubtedly in the mind of the man who prepared it. Advertising of this kind is certainly intelligent and must reap its own proper reward.

A CORRESPONDENT from Cleveland, Ohio, referring to the action of the Carpenters' Union in that city, gives it as his opinion that the carpenters have cut business "square off" by reason of their demands. One architect is the authority for the statement that four large enterprises have been indefinitely abandoned on account of the prospective increase in wages.

VALLEY CITY, Dakota, is about to build a $15,000 hotel to plans prepared by Duncan Macdonald, of that city. Jamestown, Dakota, will build this season a court house costing $27,000. The plans were prepared in Milwaukee.

MESSRS. PORTER & PERCIVAL, architects, of Buffalo, N. Y., have prepared the plans for a block of stores estimated to cost $9000, the contracts for which will soon be let.

A NUMBER of very fine residences are to be built in Buffalo this year, among which may be mentioned the following: Mr. R. Keating will build of brick, at a cost of $35,000, to plans prepared by Mr. E. L. Holmes. Mr. A. I Wright will build a frame residence, at a cost of $12,000, to plans prepared by the same architect. Mr. I. F. Schoellkopf will build a brick residence, at a cost of $50,000, to plans prepared by Mr. G. I. Metzger.

ROME and Utica, N. Y. each contemplate the erection of a jail during the present year.

GEO. W. RAPP, architect, of Cincinnati, has in preparation designs for a brick residence for Mr. F. L. Ratterman, to be erected at Clifton, also a residence for Mr. W. H. Hoffmann to be erected on Walnut Hills, the cost of the latter being estimated at $25,000.

A NEW SCHOOLHOUSE will be erected the present season at Troy, Ohio. Messrs. Peters & Burns, of Dayton, Ohio, are the architects. The estimated cost is $40,000.

MR. J. VANDERBURG, of Saratoga, will build a residence costing $5000, for which Messrs. Case Brothers have the contract.

AT RALEIGH, N. C., two Methodist churches, costing $14,000 and $8000 respectively, are in progress. A masonic hall costing $3500, to plans prepared by F. B. Austin, of that place, will be built this season.

A $30,000 JAIL is to be erected at Owego, N. Y., to plans prepared by T. I. Lacy, architect of Binghamton.

MR. D. M. ROGERS, architect of Fulton, Ky., has prepared plans for a number of residences to be erected at Union City, besides several to be built at Fulton. The cost of these buildings ranges from $2000 to $5000.

THE TEMPLE BUILDING and Loan Association, of Baltimore, are now erecting a new hall at Hampden, Baltimore Co. The corner-stone was laid a short time since. The building will be of brick, three stories high and trimmed with marble. The first story will contain four large stores with iron fronts. The second will be fitted up as a hall for the accommodation of entertainments, theatrical performances, and the like. The third story will contain three lodge rooms for the Order of Odd Fellows. The roof will be of slate. The building when completed is estimated to cost $20,000. The designs were prepared by Messrs. J. N. & W. F. Wilson, of Baltimore.

JAMES W. MCLAUGHLIN, architect, of Cincinnati, has at present in progress a house and stable for Mr. Truman B. Handy, of Clifton, near Cincinnati, costing $90,000.

AT THE TIME of going to press with our last issue it was pretty generally understood in building circles in this city that mechanics in various lines were about to demand an advance in wages, and that to enforce their views upon employers they had made arrangements for strikes, in case extreme measures became necessary. One after another of the several trades, beginning with the carpenters and stairbuilders, made known their wants, and in almost every instance, after a little time for consideration, their demands were complied with, so that no general strike has taken place. We are justified in saying that there has been a general advance in wages in this city during the past month of from 25 to 50 cents per day. The advance demanded by carpenters was from $3 to $3.50, which was conceded by over 50 of the most prominent contractors on the first day.

MESSRS. CUDDELL & RICHARDSON, of Cleveland, Ohio, are the architects of a brick block to be erected on Champlain street in that city, occupying an area of 40 x 80 feet. The same architects are preparing plans for a block on St. Clair street, 60 x 130 feet in size, and five stories high.

THERE IS PROSPECT of a brisk building season at Saratoga Springs, N. Y. Mr. Spencer Trask, of this city, will put up a frame residence, costing $10,000, to plans prepared by S. Gifford Slocum, of Saratoga. Mrs. John Lawrence will put up a brick residence, costing $8000, to plans prepared by O. C. Moody, of Saratoga. W. W. Worden will be the builder of both of these improvements.

A RESIDENCE for Mr. John Ralfs, on Price Hill, Cincinnati costing $12,000, is in progress, to designs prepared by Theo. A. Richter, Jr., architect, of Cincinnati.

MR. A. SHINKLE, of Sandy Creek, N. Y., is the architect of a banking house to be erected at Pulaski, costing $10,000.

A COURT HOUSE, costing $80,000, is in progress at Cambridge, Ohio. Mr. J. W. Yost, of Columbus, Ohio, is the architect. The same architect is in charge of the jail now being erected at Caldwell, same State.

AT KIRKLAND, N. Y., the Clinton blast furnace is to be rebuilt at an estimated cost of $60,000.

THREE PROMINENT manufacturing enterprises have been recently located at Troy, Ohio; the Starch Mfg. Co., with a capital of $60,000; the Iron Scraper Co., with a capital of $50,000, and the Iron Monitor Co., with a capital of $35,000. Buildings for manufacturing purposes will be erected by each of these.

MESSRS. S. H. & B. F. ADAMS are the builders of the free library building being erected by Mr. Enoch Pratt, on Mulberry street, near Cathedral, Baltimore. Charles L. Carson, of Baltimore, is the architect. The estimated cost of the building is $250,000.

EDWARD BRADY is excavating for an apartment house, to cost $20,000, for Mr. Samuel Weymen, at the corner of Park avenue and Eager street, Baltimore. Charles Cassell, of Baltimore, is the architect.

AT DE LAND, Florida, a town hall, costing $9000, to plans prepared by J. Y. Parce, of that place, is in contemplation. An asylum costing $8000, a sanitarium costing $23,000 and a church costing $4000 are also contemplated.

A $1000 JAIL is in progress at Smithfield, N. C., the plans of which were prepared by T. M. Halt, of Middleburg.

A LARGE school building is in contemplation at Bridgewater, Va., to be built under the auspices of the German Baptist Church. A United States court house is being talked of at Harrisonburg, Rockingham County, Va.

A BAPTIST CHURCH costing $12,000 is to be built at Fort Smith, Arkansas.

A COTTON FACTORY is to be erected at Hamilton, Ont., this season to designs prepared by James Balfour, architect, of Wentworth. The estimated cost is $250,000.

J. C. CADY, architect, of New York, has prepared the plans for a residence, costing $50,000, to be built for W. B. Gage, of Saratoga.

THE CINCINNATI STAMPING CO., are about building a new brick factory, at a cost of $15000, to designs prepared by Mr. Geo. W. Rapp, architect.

MR. J. D. PRINCE, of Islip, N. Y., proposes to build a $50,000 residence during the present season. J. N. Plum, of the same place, has in contemplation a frame house to plans prepared by Mr. J. A. Wood, architect, of New York city.

MR. S. A. HANNAFORD, architect, of Cincinnati, Ohio, has prepared the plans for a $10,000 frame residence for Mr. J. D. Taylor, to be erected at Cambridge, Ohio.

AT PULASKI, N. Y., a masonic building is being erected, at a cost of about $10,000, to designs prepared by Mr. G. S. Filkins, of that place. An opera house, costing $30,000, is also in contemplation.

ARCHITECTS, generally, throughout Cincinnati are very busy at the present time, mostly on private dwellings to be erected in the suburbs.

AN OIL FACTORY, costing $15,000, is under construction at Washington, La., to plans prepared by William Schwing, of New Iberia, of that state.

A NEW HOTEL is to be built on the corner of St. Clair and Seneca streets, Cleveland, Ohio, at a cost of $40,000.

ADVICES FROM various sections of the country indicate that in part the expectations of mechanics, of an increase in wages this season, have already been realized. On the other hand, in some localities in which the building business promised well a few weeks since the outlook is not so favorable at present.

CARPENTRY AND BUILDING

A MONTHLY JOURNAL.

VOLUME IV. NEW YORK—JUNE, 1882. NUMBER 6

Amateur Photography.

It is but a comparatively short period since a photograph was a curiosity. The invention of the celebrated Daguerre excited great interest at the time, and likenesses in neat cases were highly cherished by the people of his day. Some of them may be found to the present time in almost every household. In the course of time, however, the photograph supplanted the daguerrotypes, until of late photographic portaits have become almost as common as prints. Still another step in advance has recently been taken. The art of photography which, until recently, has been the special property of experts, has lately become the heritage of every person who will take the trouble to do a little careful work with some simple apparatus and inexpensive chemicals.

One can scarcely take up a literary or technical journal at the present time without noticing an advertisement of amateur photographing apparatus, in which the reader is assured that, by means of the outfit furnished by the advertiser, a person without previous instruction can make good pictures at very small cost. The invention of what is called the dry gelatine plate process in making photographs, has rendered it possible to simplify the operations connected with photographing, and has laid the foundation of the large trade which now exists in amateur photographing appliances.

Aside from the mere amusement to be derived from taking pictures, as the satisfaction which one would feel in having photographs of the house in which he lives, or of some striking landscape which he sees when on an excursion into the country, there are various practical applications to be made of the art of amateur photography. There is scarcely a manufacturing establishment in the country that does not require, at one time or another, photographs of the goods it produces; or, to put it otherwise, there is scarcely a concern which could not use photographs of its goods to great advantage, if they could be produced cheaply and without too much trouble. The same thing applies in a great measure to the business of architects, builders and real estate owners. In short, amateur photography, instead of being an amusement, is a new adjunct to business—something which may be employed in various directions with profit.

The application of photography to the business of the architect is so evident that attention scarcely needs to be called to it. The ability to show in an effective manner the appearance of work already executed, whether it be the exterior of a building or a bit of interior arrangement and decoration, cannot fail to be of advantage in obtaining new clients. To the architectural student the ability to seize upon and keep any architectural feature which may impress itself upon his mind in his travels is of great importance. There are still other applications. The intelligent and enterprising builder must be desirous in many cases of preserving pictures of the houses he executes. Such a collection would certainly be of great interest to him, even if it possessed no features of a business character. But business would certainly grow out of it. The real estate dealer must see the advantages of being able to take cheap photographs of the property he has for sale, and of exhibiting them to the would-be customer in lieu of long trips to examine the premises. In short, the applications of the art of photography to the every-day affairs of life, embrace a list too long to enumerate. We can barely hint at a few as a suitable introduction to an account of some experiments which we recently undertook in the interest of our readers.

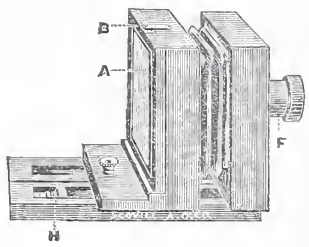
Having had our attention repeatedly directed to amateur photographic outfits, and being impressed with the importance of this art in the directions we have named, we determined to make some experiments which would either demonstrate the correctness of the claims made for it, or prove that it was altogether different from what its sanguine promoters represented it to be. We accordingly procured a "B" outfit from the Scovill Manufacturing Co., No. 423 Broome St., New York, also a copy of the book published by that company, entitled "How to Make Pictures," a notice of which appeared in our columns some months since, and set to work.

Cottage at West End, Long Branch.—Engraved from Photograph taken with a "B" Amateur Outfit.

We have already stated that a little careful work with some simple apparatus and inexpensive chemicals will produce satisfactory pictures. Our assertion is based upon the results of our own experiments, which we shall relate somewhat in detail in order to convince our readers of the correctness of this statement. Our selection of apparatus was governed somewhat by the advice of the manufacturers. It represents a medium grade and something that is available to every one who has use for articles of this sort. The outfit we employed and which is adapted to making pictures 5 x 8 inches in size, consists of a camera shown in Fig. 2, a patent double dry plate-holder, Fig. 4, a tripod camera stand, Fig. 3, a Waterbury single achromatic nickel-plated lens with standard

English flange, and a carrying case. These items comprise the apparatus for taking the pictures. The chemical accessories for making the negatives embrace the following items: Two black japanned pans, Fig. 5, a graduate, a set of scales and weights for apportioning the chemicals, a "ruby" lantern, Fig. 5, for lighting the dark room during development, and the following chemicals: Bromide potassium, neutral oxalate potash, protosulphate iron, hypo-sulphite soda, alum, and sulphuric acid. There was also provided a bottle of what is called the "Koystone" varnish for finishing the negatives. A dozen 5 by 8 bromo-gelatine dry plates completed the outfit in this direction. The "paper" outfit consisted, in addition to the above, of a printing frame, Fig. 6, a porcelain pan, some sheets of paper, some French azotate and chloride of gold for toning, a graduate, a quantity of hypo-sulphite of soda, cardboard for mounting the photographs, form for trimming prints, &c.

For the benefit of all who may be interested, we will give the price of these goods as sold in the market. The "B" outfit as above specified sells for $12, the chemical outfit for $7.50, and the paper outfit for $6,



Amateur Photography.—Fig. 2.—Camera and Tube.

making the total cost $25.50 for all that w used. This investment is very small as compared with the cost of the appointments in an ordinary photograph gallery, and it is also small when compared with the results which may be achieved by it. In this connection it will not be out of place to state that the "tube" to the camera of an ordinary outfit of the kind in common use alone costs considerably more than the total expense of the outfit and materials we employed. Outfits costing only about half as much as the figures we have named, and equally good so far as they go, are to be had. Of course, much smaller pictures are produced with them. A 5 by 8 picture, which is the capacity of the

Fig. 3.—Folding Tripod for Supporting Camera.

apparatus we have described, is larger than most of the photographs commonly seen.

What we set out to do was to photograph a seaside cottage, believing that it would be a fair subject for demonstrating what amateur photography could do, and that it also, as presented in this connection, would be of interest to our readers at this season of the year, when seaside architecture receives particular attention. The result of our effort was, among others, the photograph from which our first-page illustration was engraved. We will give some particulars about the house further on. For the present we will confine our attention to the several steps required in producing pictures with the ap-

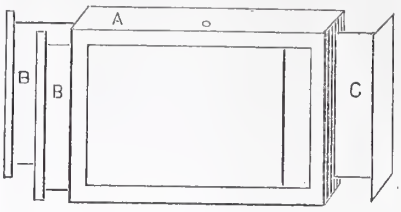


Fig. 4.—Patent Plate Holder.

pliances we have named, giving enough detail to make the reader intelligent with reference to the work, but omitting many necessary particulars for lack of space, a full account of which will be found in the book which was our guide.

The first step taken was to fill the plate-holder. By this is meant taking the prepared plates which are to become negatives from the package in which they were received from the makers, and transferring them to the plate-holder to be ready for insertion in the camera when required. It is essential that this operation should be performed in a dark room or closet, from which all other than "ruby" light is excluded, and here comes in the use of the lantern mentioned in the list of items above. Without going into a scientific explanation of the matter, we may remark, in passing, that ruby light—that is, a light from a lamp through ruby-colored glass—does not affect the plates, which, for the results to be reached, are made sensitive to ordinary light. Hence, in several operations, a dark room—one from which daylight is carefully excluded—is necessary. The ruby lantern

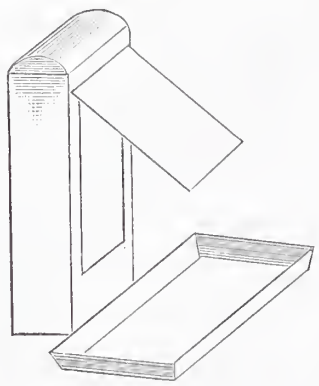


Fig. 5.—Ruby Lantern and Tray.

affords the necessary illumination for working in this room. Instead of darkening a room in daytime, however—a matter somewhat difficult of accomplishment—the necessary dark work may be performed at night in any convenient apartment. This was the plan we pursued.

Having filled our plate-holder according to the directions, we first performed one or two experiments, in order to determine the time of exposure necessary to take a picture. To facilitate experiments of this kind a note-book is supplied with the chemical outfit, in which a record of each operation can be conveniently made. Having determined just what was required in particulars of this kind, we were ready to undertake the actual work proposed. The case provided by the manufacturers is amply adapted for carrying everything necessary to take into the field except the tripod, which is jointed in such a manner as to pack in very small space, and may be carried conveniently by a shawl strap. Having provided ourselves with one or two extra plate-holders in order to have a larger supply of plates than would be provided by a single holder, we took our apparatus in hand and boarded the train for Long Branch. Several desirable subjects for our purpose were soon found, and a number of exposures were made. Without entering into unnecessary details we will simply say that at the end of a few hours we had made a half dozen exposures and were ready to return home. The plates, after an exposure has been made, may be kept in the plate-holders any length of time. The succeeding operations in the process upon which amateur photography is based do not need to follow immediately. Hence a traveler may take pictures of the scenes he visits, making the exposures as he journeys, leaving the development of the negatives until he gets home, even though months of time transpire in the interval. Or one person may make the exposures and send the plates to another for the final work necessary to making the prints.

Developing the negatives after the exposures have been made is the nice operation connected with the work. This is the most important step to be taken, and the one in which the amateur is likely to fail, if he fails anywhere. Accordingly, we shall be particular in describing just how this work is done. Previous to beginning these operations it is necessary to have prepared certain solutions according to the directions in the book, which in brief are as follows: An oxalate solution, which consists of 5

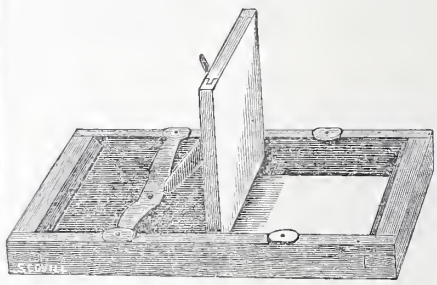


Fig. 6.—Printing Frame.

ounces of the neutral oxalate of potash, mentioned in the chemical outfit, dissolved in 20 ounces of water, to which are added 20 grains of bromide of potassium. An iron solution which consists of 5 ounces of protosulphate iron dissolved in 20 ounces of water, to which are added 20 drops of chemically pure sulphuric acid. A bromide solution which consists of 1 ounce of water in which are dissolved 60 grains of bromide of potassium; a "hypo" solution which consists of 4 ounces of hypo-sulphite soda dissolved in 24 ounces of water; an alum solution, which consists of any convenient quantity of water, with as much alum as the water will take up: the gold solution, which consists of 7½ grains of chloride of gold dissolved in 7½ ounces of water, and the hypo solution for prints, which consists of hypo-sulphite of soda, 4 ounces, common salt, 1 ounce, sal soda, ½ ounce, and water, 32 ounces. These solutions are called stock solutions, as they will keep good any length of time, and when once made are always ready for use when required. Our object in mentioning these solutions in detail is to show how simple the chemical part of the process is, and that it is really easy of performance, if care in details is taken.

Having these stock solutions at hand, ready for use, and being shrouded in the darkness of an evening, the only light in the room being the ruby lantern, we commenced upon this part of our work. The first operation in developing the negative was to fill one of the black japanned pans partly full of water, and to remove one of the plates from the holder and place it in the water with the sensitive side uppermost. Allowing the plate to remain in the water, we next mixed the developing solution according to the directions of the book as follows: By means of the graduate we measured out 2 ounces of the oxalate solution, which we poured into a glass tumbler appropriated for the purpose. We then added thereto ¼ ounce of the iron solution. By shaking the tumbler the two ingredients were thoroughly mixed. Then pouring off the water from the tray, and taking care not to handle the surface of the plate, we poured the developing solution from the tumbler into the tray and upon the plate. Experience showed at

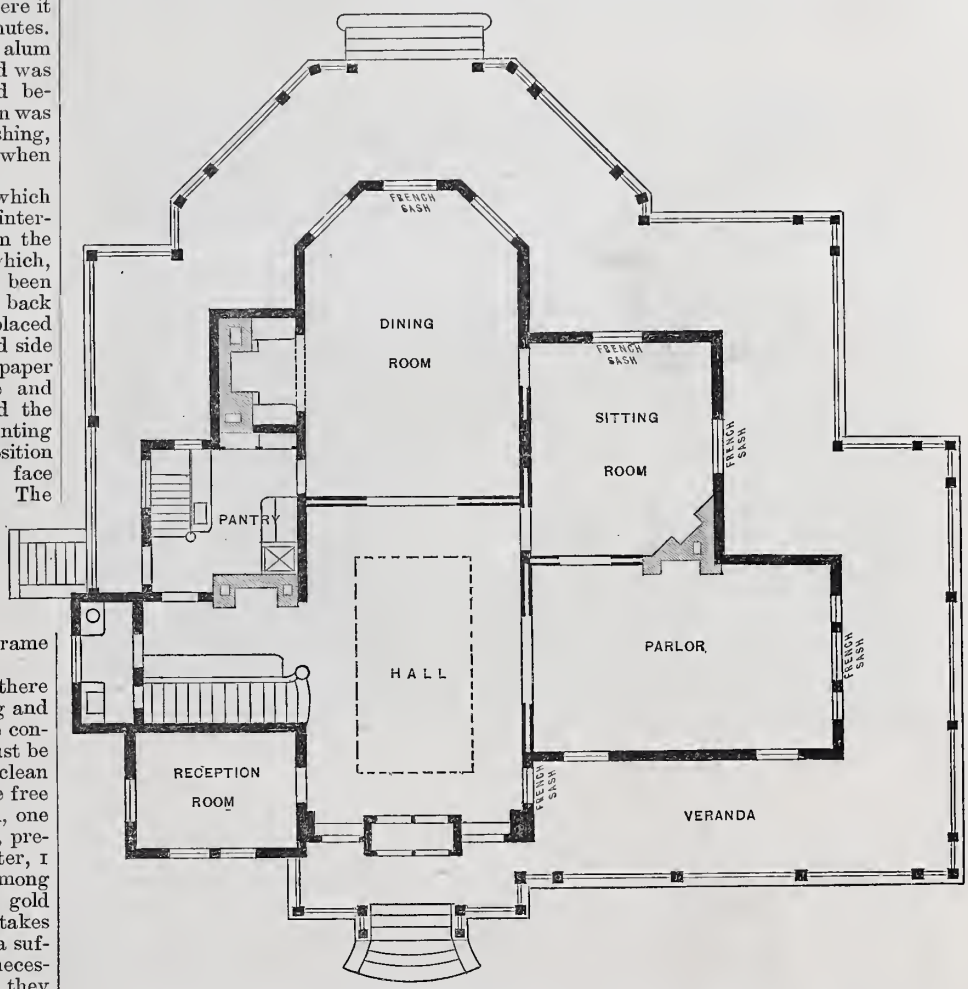
this stage that the developing of the plate in some cases proceeded slowly, and that patience and care were necessary. After the plate had remained in the developer until what was of a milky whiteness began to turn gray in color, and the image seemed to fade away, the solution was poured back into the tumbler, and clean water again put upon the plate. Considerable rinsing in fresh water at this stage was necessary as preparation for the next process, which is termed "fixing the plate."

This consists in immersing the plate in a sufficient quantity of the hypo-solution poured out into a tray used for this purpose only. The plate must remain in this solution until all traces of the white portions have disappeared from it when viewed from the back. The plate was then taken out of this solution and washed thoroughly. In order to make sure that all traces of the previous solution had been removed, the plate was next immersed in the alum solution, where it was permitted to remain about five minutes. The plate, on being removed from the alum solution, received its final washing, and was then set up to dry. After the plate had become thoroughly dry, the next operation was coating it with varnish. After varnishing, the negative was again allowed to dry, when it was ready for the printing frame.

The process of printing is that in which the amateur is likely to be the most interested, because in it he has before him the first tangible results of his work all of which, in a certain sense, has up to this point been done by faith alone. Removing the back from the printing frame, Fig. 6, we placed the negative therein with the varnished side up. We took a piece of the sensitized paper from the envelope in which it came and placed it with sensitized surface toward the negative. Returning the back of the printing frame to its place we fastened it in position by the springs, and turned the frame face upward and exposed it to strong light. The length of time necessary for the exposure to the light we found is to be determined by the appearance of the picture, which can be examined during the printing by removing the frame to a weak light and examining it by removing one-half the back of the frame as shown in the cut.

After the prints had been made there remained the final operations of toning and fixing them. These operations must be conducted in a weak light. The prints must be immersed in three or four changes of clean water for the purpose of removing the free silver, after which they are introduced, one or two at a time, into the toning bath, prepared as follows: 7 ounces of clean water, 1 ounce of the French azotate mentioned among the chemicals, and 1½ ounces of the gold solution. The change of color which takes place in the prints while in this bath is a sufficient guide as to the length of time necessary to keep them therein, after which they are placed in clean water and are ready to be fixed. We poured out a sufficient quantity of the fixing solution to cover the prints, and then removed them from the water to it, where they were allowed to remain about 20 minutes. All the operations of taking the picture were now complete, and it only remained, by sufficient washing, to remove all traces of the last solution from the prints, which was done by allowing them to soak for a certain length of time in several changes of water. The operation of mounting the pictures upon cardboard need scarcely be described in this connection. At this stage our work was done, except the preparation of this account, for which it had really been undertaken. We had produced a number of pictures which we were rather proud to show, and which were pronounced by experts to be unusually fine. From the time of first taking up the apparatus until we were done a little less than a week elapsed. We used the evenings as a convenient substitute for the dark room, and attended to our regular duties daytimes. We felt, when we were through, that we had satisfactorily demonstrated the practicability of the art of amateur photography with the use of the apparatus now in the market.

A word or two about the seaside cottage which forms the subject of our first-page illustration. The engraving having been made from a photograph produced by the process above described, a short description will be in order. This cottage is located at West End, Long Branch, and faces the sea. The view we present is taken from the land with the water as a background. The owner of the cottage is Mr. C. F. Woerishoffer, of New York. The design was prepared by Mr. William Scheckel, architect, 346 Broadway, this city. As being of interest in this connection, we have engraved the first-floor plan of the cottage and present it herewith. We have not space to enter into a detailed description of this design, which possesses many unique and desirable features. In the execution of the plan the house has been finished in native hard woods, and the interior presents a very fine appearance. In the second story, a gallery extends around the hall which is a prominent feature of the house, making this apartment higher than



First Floor Plan of the Sea-Side Cottage shown in Perspective on page 99.—Scale, 1-16 Inch to the Foot.

would at first be supposed from a glance at the floor plan. The hall is lighted by a skylight in the roof.

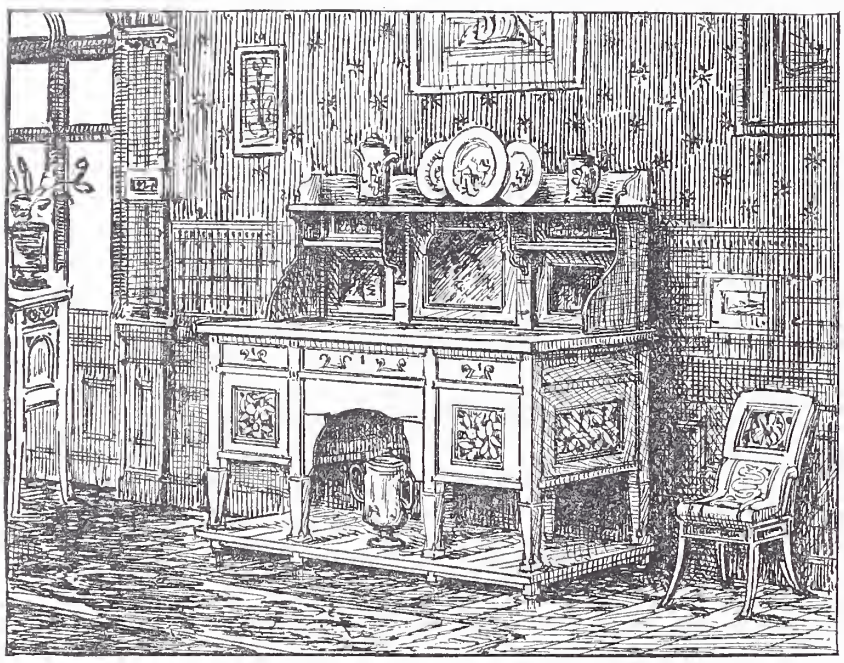
Terra-Cotta Bass Reliefs.

Six pieces of terra-cotta work, to be placed over the Broadway entrance of the new opera house between Fortieth and Forty-first streets, are shown at the workshop of the sculptor, Domingo Mora, a Spanish artist recently settled in this city. Of the six pieces comprising the group for the new opera house, two are medallions, 2½ feet in diameter, showing the heads of Wagner and Beethoven in *bass-relief;* two, to be placed under the medallions, and measuring each 3 feet 8 inches by 3 feet 9 inches, are *bass-reliefs* of groups of children representing "The Song" and "The Dance," while the two others are *bass-relief* panels, to be placed alongside of the squares and continuing the general idea in them through the medium of two figures only. The Beethoven and Wagner reliefs are faithful reproductions of the faces and heads made familiar by photographs, the rugged outline of the one contrasting with the clean-cut contour of the other. The relief in these, as in all the pieces, is bold, on account of the elevated position they occupy. "The Song" is a spirited grouping of eight singers, with a leader and two musicians. All are boys. The faces are by no means characterless, the attitudes are easy, and the youthful bodies are accurately modeled. "The Dance" is another group of boys, circling about in rollicking dance two of their comrades. One of the revelers has lost his hold and fallen to the ground, and a companion is assisting him to rise. A tambourine at one side and scattered flowers are part of the idea. The panel representing the dance shows a refinement over that of the square piece, just as the panel of song is more dignified than its corresponding square. In the first, a maiden of dainty form, lightly clad, is tripping by, her face expressive of modesty and restrained delight. At her right is a youth who acts as her escort. The second panel pictures the severe and the lighter classes of music. A woman soberly clad, having suspended at her back a lyre, is represented as beating a triangle and walking with dignified carriage, personifying classical music, while the lighter style is shown by a Pan-like youth at her side playing upon the flute and beating a drum. All the pieces are to be of a buff-colored clay, and will be well set off by the supporting wall of red brick.

The book establishment of Mr. William T. Comstock was damaged by fire on the afternoon of May 17. Mr. Comstock has recently removed from Broadway, near Fulton street, to Astor Place, which at present is more nearly the center of the book trade. He had scarcely got settled in his new quarters before the fire occured above mentioned. The damage to his stock was mostly on that contained in the basement of his store, and consisted largely of Cummings' "Architectural Details," a work deservedly popular among architects and builders generally. We understand the loss was fully covered by insurance.

Cottage Sideboard.

The design of the sideboard, a perspective view of which is afforded in Fig. 1, was made with a view to simplicity of form and construction, so as to make it desirable for any one who is familiar with the use of simple wood-working tools, and at the same time to keep the cost within a reasonable figure. The design was prepared by Mr. John W. H. Watts, of Ottawa, Canada. From his description we learn that he intended to use ash for all portions exposed to view, maple or some other hard wood for the posts, while the inside work was to be of pine. In some sections of the country, we presume that for the latter, white wood, or poplar, as it is called in the middle Western States, would be preferred to pine. In the construction, two frames checked into posts are employed. One is placed at the under side of the drawers, forming their runners. The other is placed a few inches from the floor, and is sheeted with narrow tongued-and-grooved



Cottage Sideboard.—Fig. 1.—Perspective View.

stuff. Facings 2 inches by 1 inch are placed between the posts to cover the edges of the boards and frame. This forms the base of the article. Two smaller frames are required to form the bottom of the cupboards at each side. The top of the sideboard may be made of two boards pinned and glued together and clamped at each end. In the construction the whole work should be pinned together as far as possible. Where screws are used they should be sunken and stopped with pins. The pins should be put in carefully and dressed off. Their presence will help to explain the construction of the article, and relieve the plain face of the woodwork. The end wood of the pins will show darker than the rest when oiled. Painted panels, tiles or embossed imitation of leather are suitable for use in the panels of the cupboards. Tile or painted decoration may also be employed under the principal shelf in the two compartments. Mirrors will add to the attractiveness of the design, if placed in the upper part, as shown in Fig. 3. The effectiveness of the design will be still further advanced by the judicious employment of brass or plated drawer pulls, an indication of which is shown in both Figs. 1 and 3. This design is cheap of construction, and as we have already remarked, the features are such that any one accustomed to the use of simple woodworking tools can make it without difficulty. The details presented in Figs. 2 and 3 show all the parts very clearly.

In cutting pockets in window-frames it isn't necessary that the pockets be large enough to hold both sashes at once.—A little experience in this branch of the business is of great advantage.

NOTES AND COMMENTS.

Now that the picnic season is at hand, various designs for out-door use are considered. One of our foreign exchanges contains a description of a novelty recently brought out in England, which will bear mentioning in this connection. It is called a portable picnic table. When shut up and ready for transportation it resembles a hand trunk, being a substantial-looking box of, say, 24 or 30 inches long, 18 inches high, and perhaps 6 inches wide. A handle for carrying adds to the convenience of transportation. By ingenious, yet practical, means, this article is easily extended to a firm and handy table of the usual hight, thus greatly lessening the discomfort at picnics where no tables are provided. The two side-walls of the box, as we have described it, turn up and form the leaves of the table. An inside wall on one side turns down and forms a shelf under the table, upon which are conveniently carried, in proper guards, an assortment of knives and forks. The inside of the box proper, after this second wall has been let down, displays an assortment of boxes, bottles, canisters, &c., where it would seem possible to carry the entire provision of a picnic party. The legs of the table are formed by ingenious sliding members, which drop down the ends and fall outward, so that the appearance of the table when in use is not unlike some of the cheap center tables occasionally found in the stores. Taken all in all, we regard it as a very ingenious device, and one likely to be a favorite in circles that are given to private picnicing. If any of our readers, from the description we have given, can catch the idea so as to devise a similar article, we have no doubt they will find it convenient for their own use, and possibly profitable as an item of business.

In England it is customary to hold, from time to time, what are called building exhibitions. One of these has recently been in progress in Agricultural Hall, Islington, London, and has proved a successful undertaking, both with respect to the number of exhibitors and the variety and quality of the devices shown. Among the goods that it is customary to present at fairs of this kind, we may mention sanitary appliances, stoves, mantels, builders' hardware, locks and door furniture, door springs, elevators, woodworking machinery, cowls and ventilators, plumbing material, cast iron work for buildings, gutters, rain water pipes, weather vanes, chandeliers, hall lamps, registers, steam fittings, mechanics' tools, roofing slate, electrical apparatus, gas regulators, &c. In this country, as we have before noted, our various industrial expositions devote departments to building matters, but so far there has never yet been organized an exhibition devoted especially to building matters. Our building interests are so rapidly assuming prominence in this country, that we believe the time is not far distant when attention will be given to matters of this sort. Frequently in our industrial affairs less space is allotted to the display of building novelties than the importance of the industries represented demands. When an exhibition is devised in the interest of the building trades, objections of this kind will be removed, and we have no doubt that benefits will be derived.

On the 27th of April a very intelligent party of English workmen landed in this city at Castle Garden, from the steamer City of Richmond. They were mostly bricklayers from Lancashire, and nearly all had their wives and children with them. They represented affairs in the Old Country, so far as regards their class, as very bad, and said it was difficult to see how they could be any worse. From their statements it appears that bricklayers are paid 9 pence to 10 pence per hour in Lancashire, but at the present time there is so little employment that a man who can earn 20 shillings per week, equal to about $5 American money, is considered as doing well. This statement shows how much better off mechanics in the building trades are in this country than in the Old Country. It is sometimes impossible to appreciate the blessings we enjoy until our attention is called to the privations of those less fortunately situated.

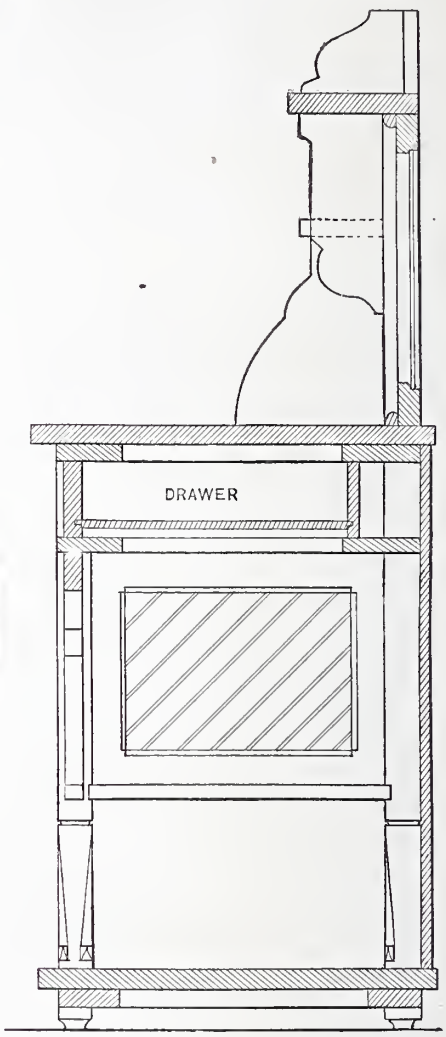


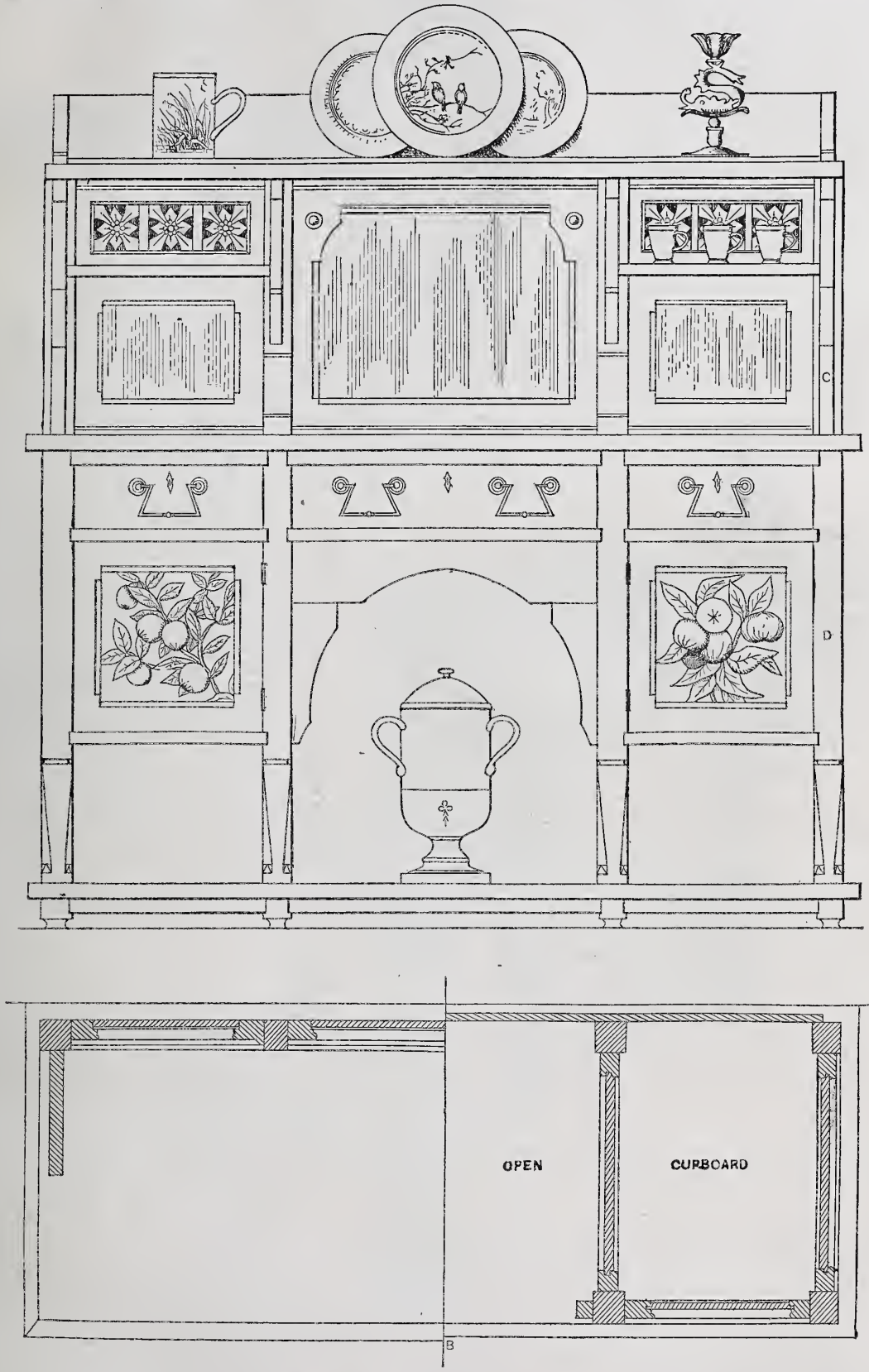
Fig. 2.—Vertical Section.—Scale, 1 Inch to the Foot.

As an illustration of possible improvement and discovery, the working of stone may be instanced. This is one of the earliest forms of industry. The first tools were made of stone, and it is among the earliest materials which men began to work upon. Yet the methods and tools are substantially the same as they were 4000 years ago, when the monoliths of Egypt were

hewn from the red granite, when the vast blocks of the pyramids were quarried, and the mighty ruins of vast antiquity were new. There have been certain improvements in machinery, such as channeling machines, steam drills, &c., but these are only the handles of the tools ; the bulk of the granite working is still done with mallet and chisel, as it was thousands of years ago. The time will come when some fortunate inventor will discover methods and tools by which granite shall be wrought with as much facility as iron.

An English authority asserts that it is a popular error to suppose that ivy growing on the walls of houses causes dampness. The presence of ivy, so far from injuring them, is an advantage, and, if the walls are dry, ivy will keep them so. Where dampness prevails ivy sucks out the moisture, and its thick foliage will prevent the access of rain to the structure, and thus it is not only a remover, but a preventive, of dampness. The only danger resulting from its presence on buildings is where fissures occur in the walls, in which case the roots will enter, and, if undisturbed, their growth will soon begin to tell upon the building, and will, by increase of growth, push against the sides of the opening, thereby enlarging it, and eventually so weaken the wall as to cause it to fall. Where the wall is sound there is no such danger, for the plant does not make fissures, although quick to discover them.

An English exchange describes a very neat modification of the ordinary method of fitting up a drying-room, by which the ventilation is entirely disposed of. The room is fitted up with the usual steam pipes, but instead of the arrangement for admitting cold air and carrying off the warm, moist air, a cold water circulation is put in at the bottom of the room, and the moisture condensed upon the surface of the pipes and carried off by suitable drains. This arrangement is applicable in many situations where ventilation may not be convenient. It has the advantage of being an entirely closed system, and when a sufficient supply of cold water can be obtained, it is said to be exceedingly advantageous and economical.



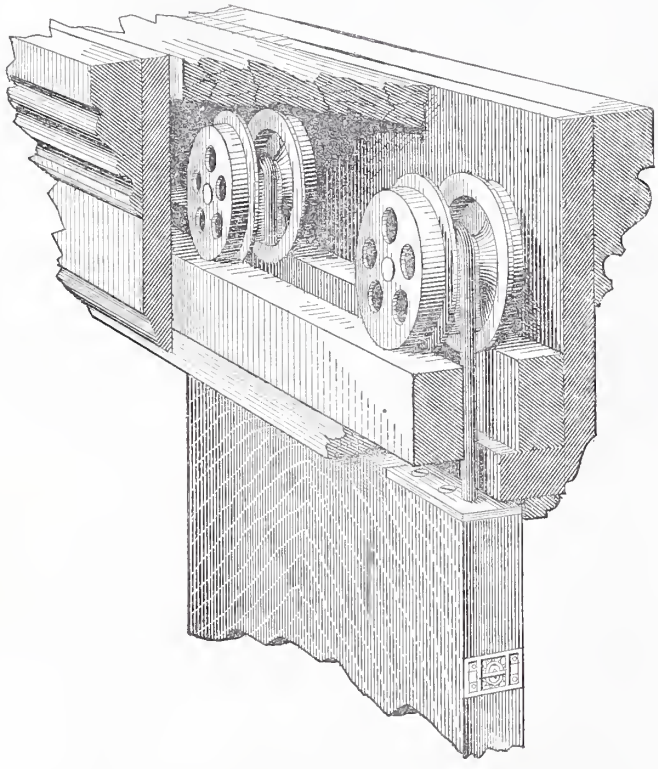
Cottage Sideboard.—Fig. 3.—Front Elevation and Horizontal Sections.—Scale, 1 Inch to the Foot.

To square the circle.—Drive a square iron pin into a round hole made in a soft board.

NOVELTIES.

FELIX SLIDING-DOOR HANGER.

A considerable amount of attention is being given of late to the matter of sliding-door hangers, upon the part of inventors and manufacturers of builders' hardware. One of the most recent inventions of this kind is illustrated in Fig. 1 of the accompanying engravings. It is known in the market as the Felix Sliding-Door Hanger, and is the invention of Mr. F. D. Berthet, of the Norwalk Lock Co., 82 Chambers Street, New York City. The features which recommend this device for use are its great simplicity, cheapness and general utility. In construction a double rail is provided, as shown in the engraving. This is rigidly fastened in position, and upon it the wheels run in pairs. The wheels are flanged, thus being less liable to break. They are also by this means kept upon the track. Each set of wheels is provided with an anti-friction metal box, over which is placed a hooked end bolt made of steel. This bolt passes down through the top of the door, and is held in position by means of a nut. To add stability to the construction, a face-plate is screwed to the top of the door. The nut holding the bolt enters the door from the edge, the opening through which it is passed being afterward closed by an ornamental escutcheon, as shown. By removing this escutcheon the nut may be turned so as to adjust the door as to hight, in case such alteration is necessary on account of settling. From this description it will appear that the device is free from complications or parts which are liable to get out of order or to wear out by ordinary usage.



Novelties.—Fig. 1.—Perspective View of the Felix Sliding Door Hanger, showing the Parts Attached to a Door.

IMPROVEMENT IN DOOR KNOBS.

Fig. 2 represents Mix's patent fastening for securing a door knob on the spindle, which embraces some features that will be of special interest to our readers. The adjustability of the knob, with reference to the thickness of the door, is accomplished by means of a latch fitting down into the slots shown in the spindle. In the engraving this latch is shown drawn forward, in which position the knob would slip on the spindle as might be required. By placing these slots or knobs upon opposite corners of the spindle, letting them come alternately, a very minute adjustment is obtained, making it possible to fit a knob without the intervention of washers to within a 16th of an inch of any required thickness. The latch is held in position, after it is closed, by an inside flange to the rose, which acts like a ferrule and covers over the shank of the knob in such a way as to prevent the latch being lifted until the rose is removed. For holding the spindle in position, lessening the strain upon the rose, and for protecting the wood of the door, a face-plate, fastened to the door by two screws, is used. This is not shown in the engraving, but adds to the desirability of the article. This improvement, which is made by the Clark Manufacturing Co., of Buffalo, N. Y., we understand, is offered to the trade at the same price as knobs of the ordinary construction.

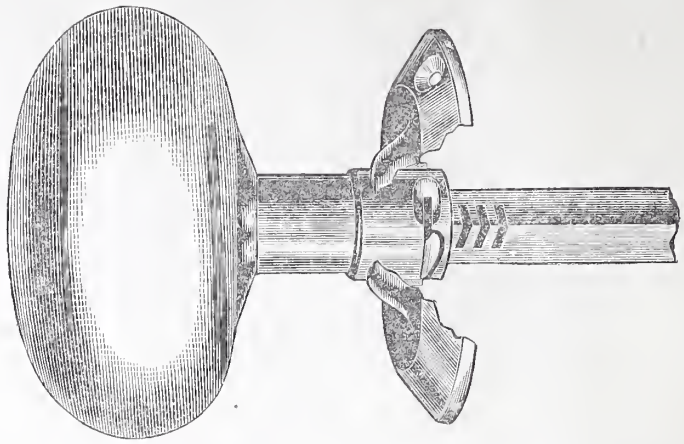


Fig. 2.—Improved Method of Adjusting Door Knobs upon the Spindle.

ENAMELED BRICK.

Mr. S. A. Rimington, whose office is at room 22, Commercial Building, Broadway, New York City, is introducing into the market some novelties in the way of brick and tile, a mention of which will undoubtedly be of interest to our readers. The goods are imported, and although they command a higher price than is obtained for articles of a similar nature and appearance made in this country, the claim is put forward for them that on account of their superior excellence they are the cheapest in the long run. Plain and enameled brick are kept in stock by Mr. Rimington, which in several particulars differ from the brick to which builders are accustomed here. Fire-clay is used in their production, and therefore they are fire-proof in a sense which the ordinary red brick of our market is not. A peculiarity of the enameling which is applied to these bricks is that, in the process of making, the enameling is done before the brick is burnt. This, it is claimed, contributes to the article several valuable qualities, among which may be named uniformity in size, thickness and appearance, freedom from crack, and uniformity of face and end. Bricks which are enameled after they have been burnt frequently show a difference in color as between the end and face, because the two parts are enameled in two successive operations. All the brick offered by Mr. Rimington are pressed and have recessed beds, a feature which results in a very strong wall with very light exposed joints. Besides building-brick of the description here mentioned, Mr. Rimington is showing a great many novelties, which, although not in use in this country, are in general demand in various sections of England. Among these may be mentioned a cement paving tile, to which is given, in the process of making, a granite face, majolica fenders for fire-places, earthenware sinks for kitchen use, and ornamental tile of various patterns and colors. A handsomely engraved sheet, showing various styles of the goods we have here described, is sent on application.

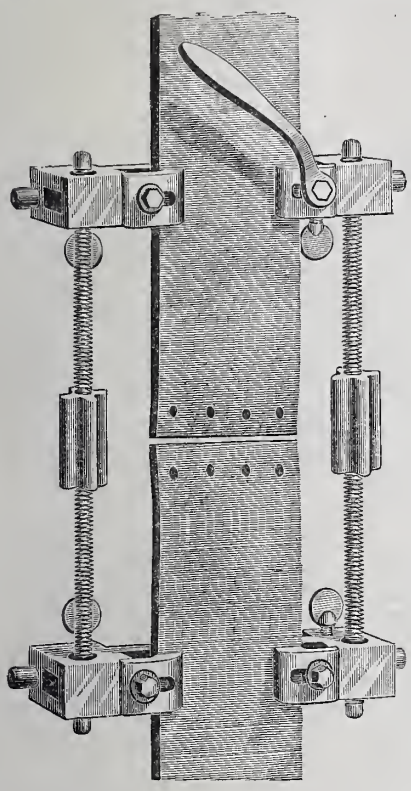
WOOD FINISH.

We have received from Messrs. Berry Brothers, No. 96 John street, New York, a unique specimen of what may be done with their white hard oil finish. A piece of work about one foot square has been made up of 28 different samples of wood, arranged somewhat after the manner of marquetry, the different shades, color and grains of the wood being arranged in a manner to best display the peculiarities of the several kinds employed. The block made up in this manner was first finished by filling the grain of the wood, and then applying three coats of the white hard oil finish, and afterward rubbing with pulverized pumice-stone and water, and polishing with rotten-stone. The result is quite pleasing. All the characteristics of the wood are maintained in so clear and distinct a manner as to remind one of a sheet of glass over the native wood after first working. Among the different kinds of wood included in this specimen may be mentioned ash, mahogany, three different shades of oak, three different shades of walnut, several different samples of satin-wood, ebony, cedar, tulip-wood and rosewood. By finishing all these different kinds of wood simultaneously, the suitability of the one material to all of them is clearly demonstrated. The specimen is one which every admirer of fine finish would be glad to possess for his own satisfaction. While it is too large to send out under ordinary circumstances, smaller samples can be sent by mail. We understand that Messrs. Berry Brothers are sending to all applicants samples of

various woods finished in this manner. The samples are about 6 inches long and nearly 2 inches wide, and show in a very satisfactory manner the character of the finish with which they are treated. We suggest that all of our readers will find it profitable to send for a set of these samples for their own satisfaction in studying the finish that may be applied to native and imported woods.

PORTER BELT TIGHTENER.

A new claimant for public favor in the way of a belt tightener is illustrated in Figs. 3 and 4 of the engravings. It possesses several important advantages over some that are already in common use, and we think is



Novelties.—Fig. 3.—Front View of the Porter Belt Tightener.

likely to become popular. It has the advantage of low price, and that it can be used upon belts that run close to a wall. It is manufactured by Messrs. Sweetland & Co., of New Haven, Conn.

In lacing large belts it is absolutely necessary to have some device for clamping the ends together. Since any accident to a belt that calls for the stopping of all or a portion of the machinery of an establishment, usually has the effect to keep a number—sometimes a large number—of men idle, it is evident that any means that shall expedite the work is a matter of considerable economical importance. The ordinary device in use for this purpose is the old-time wooden clamp, which, with its clumsiness and generally unhandy features, is expensive, in that it costs so much in the time and delay in its use. As will be seen, this device consists of four cast-iron blocks, which are each provided with a a clamping jaw, between which and the block the two ends of the belt are held. These jaws are provided with clamping bolts, by the operation of which they are made to grip the belt, and the jaws are held away from contact with the belt by light springs, which are compressed by the bolts as they are screwed down, and when loosening to remove the clamps they materially assist, by forcing the jaws away from contact. These springs also serve a useful purpose in holding the jaws at all times in a position to be easily adjusted. Rods of suitable length and size connect the blocks together, thereby preventing them from twisting while tightening the belt, which is done by means of the right and left-hand screws, as shown. To accommodate different widths of belt the blocks are clamped in any desired positions on the rods by means of thumb-screws.

It will be seen that this belt tightener has great capacity, and is almost instantly adjusted to any width of belt from 2 to 20 inches, and by increasing the length of the rods it can be used to any desired width, being limited only by the length of the rods that connect the clamps; also, that upon whatever width of belt used, the clamp jaws are always in the best possible position to hold the belt. The right and left hand screws, by the operation of which the belt is drawn together, are of sufficient length to allow the clamps to be placed at such a distance from the ends of the belt as to leave ample room for lacing, or for applying a square to the ends, if desirable.

Each of the clamps are applied separately, and when advisable the belt may be passed over the pulleys with the clamps attached. In using in places where the space is narrow, the ends of the belts, with the clamps attached, can be separately turned in a direction to afford the most room for applying the rods, after which the screws are put in place. This makes the device convenient for use where there is but little room. The nuts used in connection with the tightening screws ore held loosely in the block, and are so arranged that they will accommodate themselves to the alignment of the screws, should one side of the belt be drawn up faster than the other, in tightening.

HOLLOW BRICK.

The Raritan Hollow and Porous Brick Co, whose office is No. 115 Broadway, New York City, have issued a circular calling attention to the new facilities possessed by it for fire-proof building materials of burnt clay, both hollow and porous. Attention is called to the necessity of a change in construction, in order to guard against the dangers of rapid conflagration. It is pointed out that these dangers occur chiefly in floors, partitions and roofs. These parts of buildings commonly

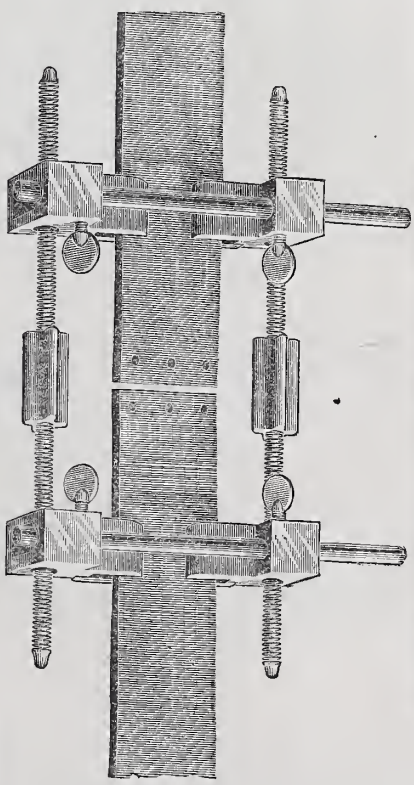


Fig. 4.—Back View of the Porter Belt Tightener.

furnish food for the flames instead of being obstacles to the progress of a fire. It is of the utmost importance to convert these parts into barriers against a conflagration, and to do this the increase of weight must not be unreasonable, nor must undue expense be involved. Owing to unusually favorable location, this company asserts that it is able to produce fire-proof hollow and porous brick at the lowest possible prices. The specialties of the company are hollow bricks of all sizes, and for all purposes to which they are applicable, and porous terra cotta bricks of any size and shape. These are extensively used for partitions, roofings, &c., and are rapidly growing in favor. They receive and hold nails as well as wood, and are thoroughly fire-proof. It is expected by the company that they will soon supersede the fire-proof partition blocks known as plaster blocks, over which they have striking advantages.

NEW TUMBLER LOCK.

Several new forms of tumbler locks of more than usual interest to the trade and consumers are being placed upon the market by the Stoddard Lock Co., 104 Reade street, this city. By reference to Fig. 5 of the engravings, an idea of one of the forms of these locks may be obtained. The style shown in the advertisement is known as the cylinder lock, and is in a very neat and convenient form for use in various places. No further preparation is required for inserting the lock than three bits, in size corresponding with the barrel of the lock, the face-plate and the key-hole piece. The material of which the lock is made is brass, thus avoiding any liability to rust by exposure. The key, as may be seen by the engraving, is of the flat variety, making it very convenient for carrying. Another form

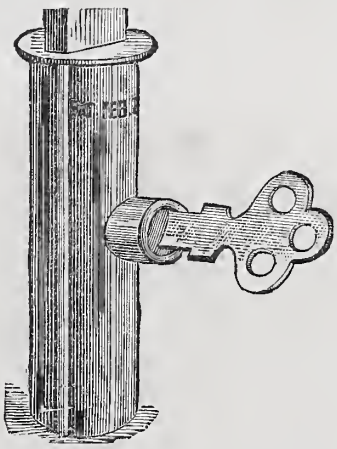


Fig. 5.—A New Tumbler Lock.

of lock of these general features is called the "Patent Recess Lock," of which the barrel is square. In connection with these locks the company make a patent key-hole and drawer pull combined, affording a very neat finish. The method of applying these locks commends itself by the great saving in labor and cost, no screws or nails being required to fasten them in position. They are particularly adapted for use as a window lock, as they take up very little space. The aim of the manufacturers has been to combine strength and durability with neatness and finish.

TERRA COTTA MANTELS.

A novelty which has recently been introduced by the The Perth Amboy Terra Cotta Co., whose office is No. 80 Astor House, New York City, possesses qualities peculiarly its own which decorators and furnishers will not be slow to notice. The article to which we refer is a mantel-piece made of terra cotta. The perfection which has been reached in working this material renders it possible to produce an elaborate chimney-piece of dimensions appropriate for the place it is to occupy. One of the advantages possessed by this material is the apparent warmth which it contributes to the furnishing of the room, making it very inviting and attractive. Some mantels of this kind have been placed in the Vanderbilt houses in this city, and they have found use in other fine residences. The manufacturers are very sanguine of giving general satisfaction with this article, to which they have devoted very careful attention. The same company make a fine line of architectural terra cotta, embracing the various articles and shapes which are required by architects and builders.

Practical Stair Building.—XX.

PLATFORM STAIRS WITH A QUARTER TURN.

The engraving which we present herewith shows the plan of a platform stairs with a quarter turn, having swelled steps and a turn-out at the bottom. The front line represents the center of the rail. The proper place to commence a drawing of this kind is at B, the corner of the quarter-turn. From B draw the straight lines C A and C. Make the risers on both flights of the same hight. Suppose, for want of room, that the treads on the second flight are only 9 inches wide, while those on the first flight are 10, set the riser at A so that the distance from B to the first short baluster shall be 5 inches, or half the width of a tread on the first flight. Set the riser at C so that the distance from B to the first short baluster on the second flight shall be 4½ inches, or one-half the width of a tread on the second flight. Produce the riser line at A through A to D. Complete the square A D C B, and from D, as a center, draw the arc line A C. Produce C B to *b*, and, with the first pitch-tread, draw the rake line A *b*. Produce D C to *c*, and, with the second pitch-tread, draw the rake line B *c*. Make the hight *k o* equal to B *b*, and draw *o k* O. Take *b* E equal to C *c*, and from E draw E *e* at right angles with A *b*. On the line B A make A E equal to E *e*, and from *c* draw the bevel line *e* D. Take *c* H equal to *b* B, and from H draw H *h* at right angles with B *c*. Make C *h* equal to H *h*, and from *h* draw the bevel line *h* D.

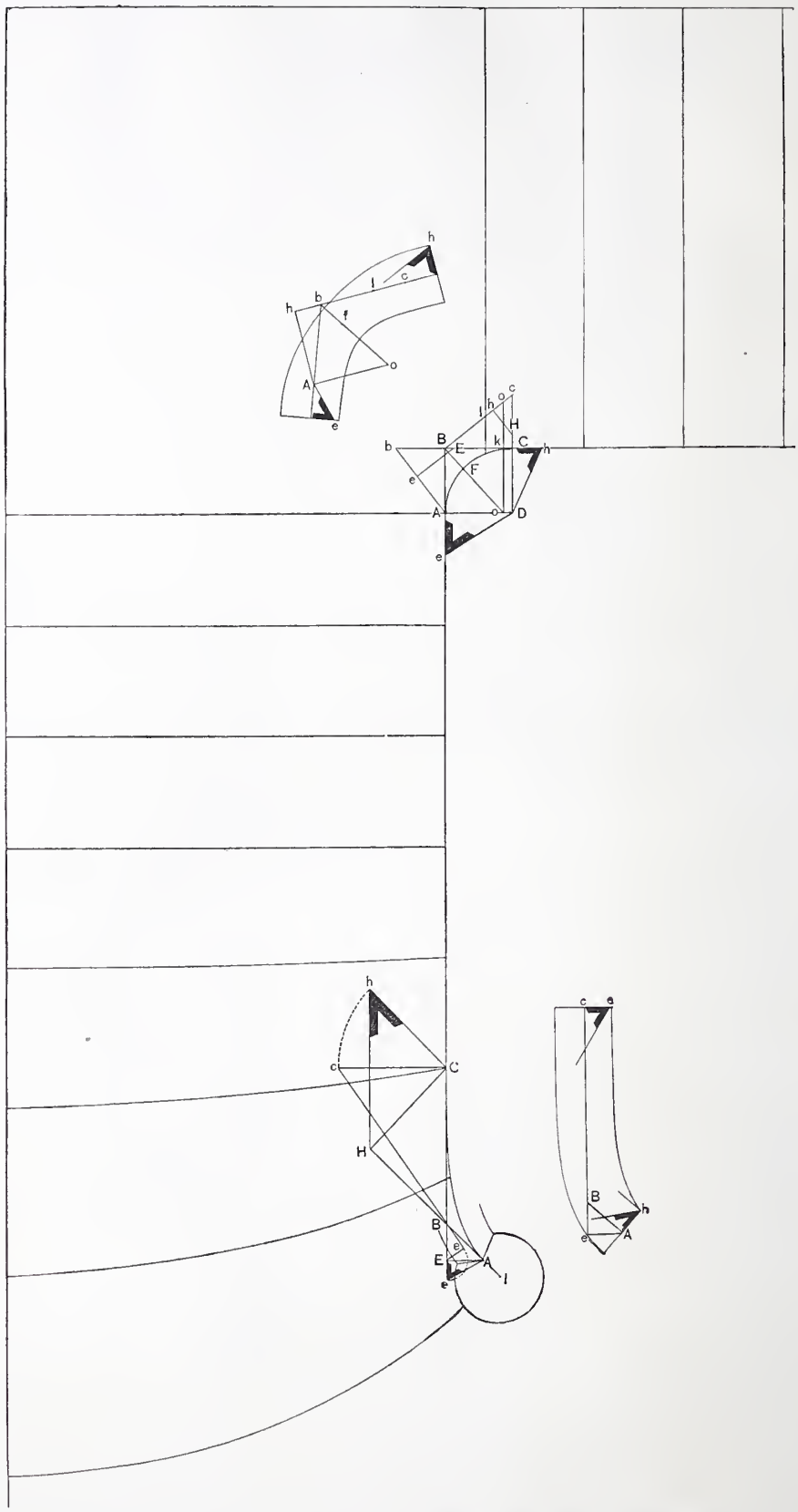
We are now ready to lay out the rail pattern, which is shown in the platform of the stairs. Make *c b h* equal to *c* B and *c h*. At right angles with *c h* draw *h* A equal to the bevel line *h* D. Draw A *b*. Draw A *o* equal to B *o*, and parallel with *b c*. Draw *o b*. Make *b f* equal to B F. To the lines *b* A and *b c* add about 3 inches at each end for straight wood, and at right angles with the tangent lines draw the butt joints. At A and *c* make the pattern about one-fourth wider than the rail. At *f* make it very slightly wider than the rail. Then, as shown in the figure, draw the inside and outside curve lines of the pattern. The bevel for the joint at *c* is indicated at *h*. The bevel for the joint at A is indicated at *e*. In drawing the plan for the swelled steps at the bottom of the stairs, care should be taken to make them gradually increase in width at the stair string, of such proportions as will admit of a natural easement curve on the stringer. In order to do this intelligently it is advisable to make a small elevation of the stair string, and after designing the steps upon it, draw the plan by means of it. The front ends of the steps do not increase in width, with the exception of the lower one, which may be made wider, so as to make more room for the newel. Increasing the width of it at the outer end also admits of a better easement twist on the rail. The turn-out of the front string on this account is usually made to correspond with a natural easement curve on the rail. To secure this, draw the plan of the rail first.

On the line C B suppose B to be the natural place of the first long baluster. Draw B I equal to two-thirds of a tread and at any desired angle with C B. Take the point I for the center of the newel, and with a radius equal to the width of the rail draw the circumference line of the cap. Take I A, equal to one-half the width of the rail, and from A draw the curve line A C. Parallel with A C draw the short curve lines representing the edges of the rail, and from their intersection with the line of the cap draw the meter lines to A as shown. Then A B and B C are the ground tangents for the twist. Draw the triangle B *c* C, showing the elevation of the tangent B *c* over B C, according to the pitch-board of the stairs. Produce C B to E and draw A E at right angles with C E. Produce *c* B to *e*. Draw E *e* at right angles with *c e*. From E as center draw the arc *e e*. Draw the bevel line *e* A. Produce I B to H and draw C H at right angles with I H. Make *c h* equal to C *c* and draw the bevel line *h* H.

To draw the rail pattern, which is shown at the right in the engraving, proceed as follows: Draw *c* B *e* equal to *c* B *e* already described. At right angles with *c e* draw *e a* equal to the bevel line *e a* of the plan. Draw A B the bevel tangent. At A and B make the width of the pattern equal to the diagonal of the square pattern of the rail. Draw the inside and outside curve lines as indicated. The bevel for the end at A is indicated by *h*, while *e* is the bevel for the end at *c*.

Cost of Fires.

According to the sworn statement of the underwriters, the property-owners in this way was $8,281,508. If these large receipts were compared with the payments made on account of fire losses, it would probably be found that the profits in the business were not great. Last year, for example, the estimated loss by fire was larger than the total of the premium receipts, leaving to the companies no margins for expenses and dividends. The moral to be drawn from large premium payments such as those that have been given above, is not that insurance companies are charging an unjustifiable price for



Practical Stair Building.—The Hand Railing of Stairs with a Quarter Turn.

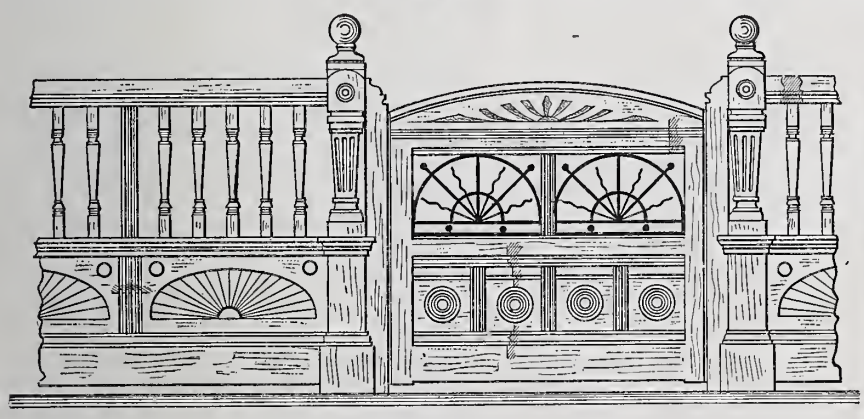
city have paid in insurance premiums during the last ten years a little less than $60,000,000. Last year the receipts of the companies were only $5,103,749, and for a year or two previous they had been somewhat less than that amount; but the average was made good by the receipts in the early years of the decade, for in 1873 the sum received in this

the protection they give, for in point of fact they are not getting enough money; the lesson taught is the enormous cost of our reckless method of building. This annual payment of $6,000,000, combined with the yearly support of a large and highly efficient fire department, is a direct tax upon the community. If all of our buildings were

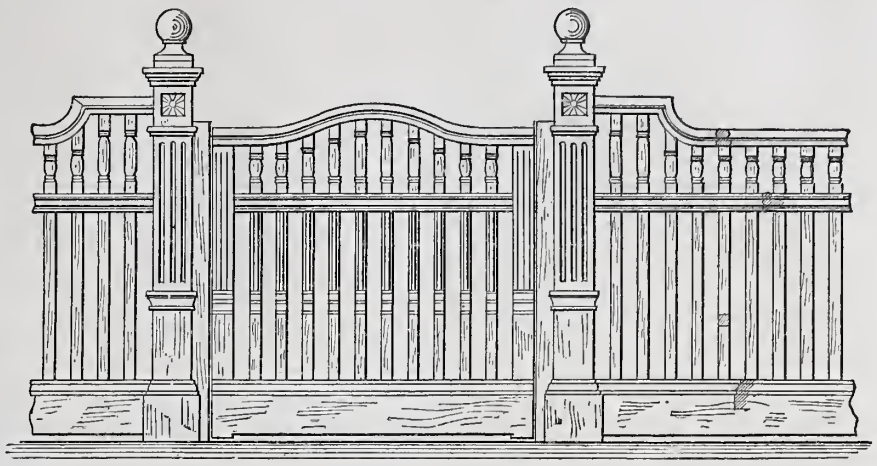
put up in a strictly fire-proof manner, it is probable that there would be an annual saving in the gross fire-protective expense of the city of not less than $5,000,000, or the equivalent of a liberal interest on a capitalized investment of $100,000,000. It is impossible to say what the additional expense would have been in making the buildings of this city as nearly fire-proof as those of Paris, but there is good reason for believing that it would have been much less than the last amount named. On this assumption it has been a waste of money in not building at the outset fire-proof structures. More than this, if the buildings of New York City were similar to those in Paris in their fire-proof qualities, the danger which is now always present of a sweeping conflagration, which may destroy a large section in the business part of the city, would not exist.

Gates and Fences.

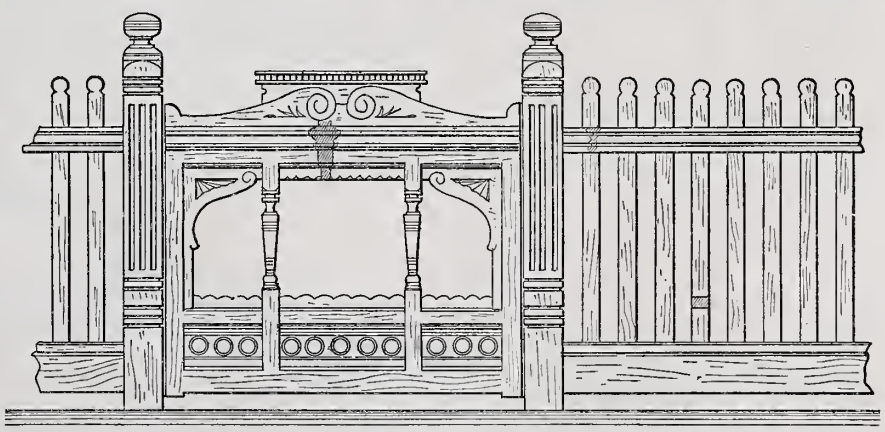
The design of the fence and its gates to be used about a handsome dwelling, is no small consideration in the minds of the architect or builder in charge. The fence in many situations is a necessity. In others, it is used merely as an ornament. Whatever be its purpose, unless it be well designed and thoroughly constructed, it fails of the object for which it was erected. We need not remind our readers that there are numerous instances in every community in which an otherwise pleasing landscape is marred by a hideous fence, or spoiled by the presence of a fence which is constantly falling to pieces. A fence to be entirely satisfactory must be not only pleasing in design, but thoroughly constructed. The design, therefore, must be in harmony with constructive features. It must be such that thorough construction is possible. Another consideration in designing fences and gates is that they shall be in keeping with the characteristic features of the buildings situated within the inclosure. There should be a fitness and harmony in matters of this kind. The designs which we present to our readers this month are somewhat original in conception, and are of a character to be acceptable for use in connection with the better class of houses erected in the present prevailing styles. It is not necessary for us to call the designs here presented by name, or to indicate what particular features of architecture predominate in them. Our readers will know what application to make of them. Figs. 2 and 3 are particularly commendable in the features of construction. They are simple in all their parts, and the construction embodied may be made as durable as that of an ordinary fence. The wrought-iron grills which are introduced in the gate in Fig 1 give it a pleasing appearance, and add life to the design.



Gates and Fences.—Fig. 1.—Fence and Gate with Heavy Base.—Scale, ½ Inch to the Foot.



Gates and Fences.—Fig. 2.—Design showing a Panel of Plain Pickets Surmounted by a Row of Spindles.—Scale, ½ Inch to the Foot.



Gates and Fences.—Fig. 3.—Design for an Open Gate and Gate Posts in Connection with Plain Pickets.—Scale, ½ Inch to the Foot.

NEW PUBLICATIONS.

UNIVERSAL INTEREST TABLES. Computed by Prof. William Jones, of Cornell University. 120 pages, 4 by 6 inches; limp covers. Published by Finch & Apgar. Price, 50 cents.

An important consideration in the use of tabulated results is the accuracy of the tables. Accordingly, "guaranteed correct," which appears in connection with the author's name on the title page, is a recommendation of this work over others of a similar character which have been put forth. In a compilation of this kind it would be impossible to include many features of originality, either in results or methods of arrangement. One feature of this book which strikes us as desirable is the use of the middle column on each page for time, the several per cents at which interest is computed being placed in parallel columns at the right and the left. The rates of interest given are 4 per cent., 5 per cent., 6 per cent., 7 per cent., 8 per cent. and 10 per cent. The time is given in days, months, and for one year. The amounts are from $1 to $100, and then by hundreds up to $1000, and then by thousands up to $10,000. A page is devoted to the interest on $1, calculated to the thousandths of a cent. Another page gives the amount of $1 at compound interest at various rates, from 2 per cent. up to 10 per cent., for various periods, from 1 to 20 years.

HINTS FOR PAINTERS AND PAPER HANGERS.—By an "Old Hand." Sixty pages, 5 by 7 inches; pamphlet cover. Published by the Industrial Publication Co. Price 25 cents.

This little work is the third of the series entitled "Work Manuals," the earlier numbers of which have already been noticed in these columns. It contains a selection of useful rules, data, memoranda, methods and suggestions for house, ship and furniture painting, paper hanging, gilding, color mixing and other matters useful and instructive to painters and decorators. It has been prepared with special reference to the wants of amateurs. It is intended to furnish the practical house painter, the every-day workman, with information sufficient to enable him to understand his business intelligently. One of its objects is to deal with the nature, characteristics, quality and defects of the materials employed by the class of artisans for whom it is written, and, to a limited extent, this has been done with as little theory as possible. High-sounding technicalities have been avoided wherever the author has been able to make himself understood without them. Our readers have frequently inquired for instructions in the subjects treated in this book, and now that a work is offered them at so reasonable a price, we have no doubt that it will meet with a large circulation. Under the head of "Paper Hanging," this little book contains some very plain and valuable directions. The closing chapter is entitled "Hints for Estimating Cost of Work and Materials."

THERE IS IN CONTEMPLATION a United States Court House to be erected at Jackson, Miss., some time during the season. The estimated cost is $100,000 and the plans are being prepared in the Treasury Department at Washington.

Throughout, the work is practical in character, and answers many of the questions which arise in actual work as well as in the practice of amateurs.

MODERN HOUSE PAINTING, by Rossitter & Wright, architects. Oblong quarto, 9½ by 12 inches; 20 plates. Published by William T. Comstock. Price $5.

When we learned that a volume was in preparation which should attempt to show by means of colored plates the appearance of a house painted in various styles, we thought the undertaking was one surrounded with difficulties almost insuperable. Accordingly we awaited with unusual interest the appearance of the book which had already been announced in our columns. Now that it is at hand and we have the opportunity of examining it critically, the feeling which is uppermost in our minds is one of disappointment, that more of the same kind has not been offered. We believe the book will be regarded by practical men, generally, as a satisfactory demonstration that the manner of painting a house may be successfully portrayed by means of colored plates. What is shown in this volume we regard as a sample of what is possible to do, rather than a complete exposition of a subject which, in its possibilities, is almost boundless.

In order to illustrate different styles of modern painting, now quite popular and in good taste, the same building, in some instances, is represented painted in two or three different ways, showing the effect of different combinations of colors. We regard this feature as a good one, as it affords the opportunity of criticism and of choice.

With reference to the treatment of interior details, the work is less satisfactory than in those portions which are devoted to the painting of the outside of houses. We think the authors made a mistake in selecting as examples of interior work, wainscoting, door and chimney-piece of a kind not ordinarily used. The specimens presented are what might be found in a house designed for an æsthete of the most advanced type. Utility should not be lost sight of in a work of this kind, and we think both author and publisher have missed the opportunity of presenting a work useful to a far greater extent than this will be, by employing in the interior designs and in some of the exterior examples, work which is seldom met in ordinary practice.

Taking the book as a successful demonstration of what may be done by means of colored plates, we hope to see it followed by works still more practical in character which shall make up for the defficiencies in this. The present book, considered all in all, is well worth the price asked for it, and should find a place in the library of every careful architect and builder who desires to keep informed in the matter of house decoration and finish.

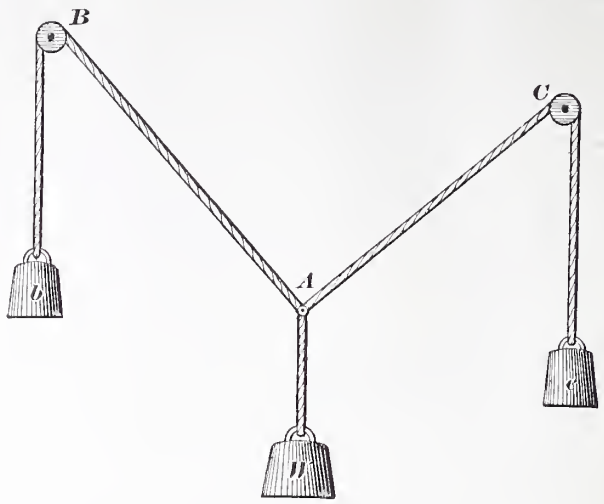
THE STANDARD MOLDING BOOK. Revised Edition. Arranged by W. B. Judson. Editor of the *Northwestern Lumberman*. Size 7 by 10 inches, 112 pages. Published by the Lumberman Publishing Co. Price 50 cents.

We noticed an earlier edition of this useful work some months since. The present edition contains several new features, and therefore we call attention to it anew. It is in reality a catalogue of moldings, brackets, architraves, balusters, newel posts, stair railing, &c., with designs for doors, door frames, windows, store fronts and the like. The name "Standard Molding Book" is applied to it as indicating its position in the trade. The designs shown are such as may be bought in almost all centers manufacturing building material, and therefore it becomes a desirable work of reference for carpenters, builders, contractors and architects. The special features which have been added to the book, and which appear in this new edition, are the introduction of a large number of profiles of moldings of recent style, and the omission of some of the house fronts and plans which appeared in the book originally, and which, while reflecting no special credit upon the work, were of no service whatever to intelligent builders. The moldings are accompanied by a price list, which will be of service in estimating. By ascertaining the discount from any reputable manufacturer or dealer, the actual cost of any quantity of work can be calculated by the use of this pamphlet.

Calculating Strains.

The subject of strains in the structures erected by carpenters and builders is a matter of great importance to them. The somewhat remarkable letter which we published in our last issue, from the pen of F. F., Grand Island, Neb., relating to bridge trusses, has excited interest in this subject, and the desire for an exposition of principles, together with easily understood explanation of scientific methods of calculating trusses and other framed structures, has been expressed by a number of our readers. Believing some attention to this subject at this time will be generally acceptable, we have prepared the article which follows. In it we have attempted to make everything so simple that mechanics who have had but little previous knowledge of mathematics will hardly fail to understand any portion of it. Should questions arise, however, as to the precise meaning of any part, or the reasons for any step taken, we trust our readers will feel free to call for the additional information they need.

There are several plans employed by engineers in making calculations of this character. Without particularizing, we will merely remark, by way of introduction, that we have chosen one by which the strains in the different pieces of a framed structure can be readily found, without the necessity of resorting to tedius mathematical operations or depending upon memory for more or less complicated formulæ. The want of a plan having these desirable features has long been felt. It is supplied by the application of the "graphic method" to strain calculations. It is our purpose in this connection to present to our readers a summary of its principles in such way as will render any one who is familiar with the use of the T-square and triangle, and who has such rudimentary knowledge of mathematics as is ordinarily possessed by mechanics, competent to apply the method to any of the structures coming under their charge.



Calculating Strains.—Fig. 1.—Equilibrium of Forces.

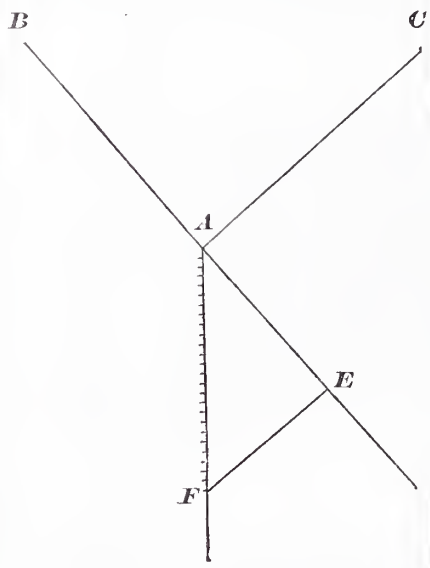


Fig. 2.—Triangle of Forces.

A framed structure is a combination of pieces of material, so arranged, dimensioned and joined together that they act as a whole in supporting loads and resisting external pressures or forces.

A truss is a framed structure, supported at its ends or at intermediate points, intended for the support of loads over openings, and finds its most common application in bridges and roofs. Bridge and roof construction involves the application of three distinct branches of mechanical science.

1. The theory of trussing, which teaches how strains are transmitted through a system of framing.

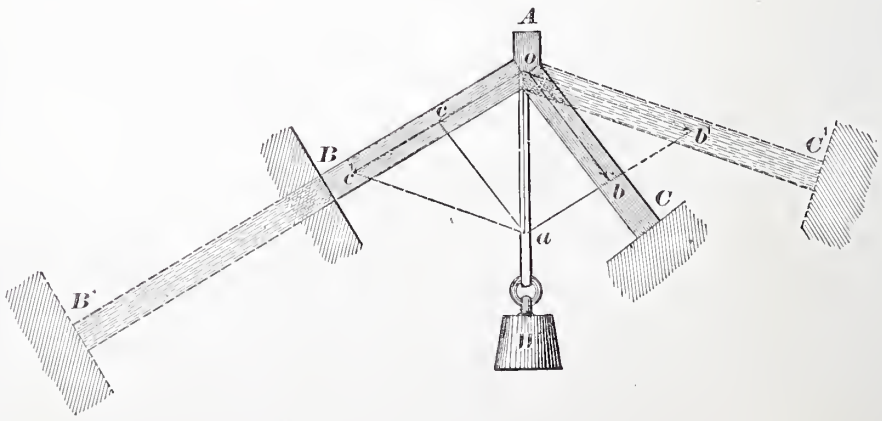


Fig. 3.—Strains in Frame A. B. C.

2. The theory of dimensioning, which teaches how to proportion the different parts or pieces of a truss, and involves a knowledge of the strength of materials, and their capacity to resist different kinds of stresses.

3. The science of framing, which consists in joining the parts or pieces of a truss in

sueh manner, and by such details, as to admit of a real transmission of the strains from piece to piece, without impairing the strength of the frame as a whole.

The theory of trussing involves nothing more than a thorough knowledge of the composition and resolution of forces and the principles of the lever. A heavy body always exerts a force vertical in direction and equal to its own weight, and would fall if not prevented by some other force at least equal in intensity and opposite in direction. But if supported by two or more forces, its effect upon these depends upon their position. The eomposition of forces consists iu finding one force that shall produee the same effect as two or more forces acting in different directions, and the resolution of forces consists in finding two or more forces which, acting in different direetions, shall balance a given single force.

If we attach two weights, *b* and *c*, to the ends of a thread or fine line, Fig. 1, then pass the line over the pulleys B and C, and by means of a knot fasten another line to it, with the weight W attached, we shall find, if *b* + *c* is greater than W, that the assemblage of weights and threads will of itself assume a certain position in which it will be at rest, or in equilibrium, and that no matter how we may try to ehange that position by pulling at either of the weights, the system will always return to that position as soon as left to itself. If we now transfer this assemblage of lines upon paper, Fig. 2, we obtain the lines $\overline{A\,B}$, $\overline{A\,C}$, and $\overline{A\,F}$, which will represent the respeetive directions of the three forces whieh are balanced at A. But if the directions of lines are used to represent the direction of forces, surely the lengths of the lines may be used to express the intensity of the forces; therefore, if we wish to find the amount of pull exerted by the weights *b* and *c*, we need only assume any scale of equal parts to represent weights, say 1 inch equal to 100 pounds, and by this scale lay off $\overline{A\,F}$ = W; then continue the line $\overline{B\,A}$, and from F draw $\overline{F\,E}$ parallel to $\overline{A\,C}$ till it intersects with the continuation of $\overline{B\,A}$ at E. If now we measure $\overline{A\,E}$ and $\overline{F\,E}$ by the same scale as laid off on $\overline{A\,F}$, we shall find their respective measures equal to the weights in pounds of *b* and *c*. The sides of the triangle A F E therefore represeut the directions and intensities of the forces acting at A, viz., the side $\overline{A\,E}$, the direetion of the force B A, and its intensity as expressed by the weight *b*, $\overline{F\,E}$ the direction of the force A C, and its intensity as expressed by the weight *c*, and the side $\overline{A\,F}$ direction and force of A W.

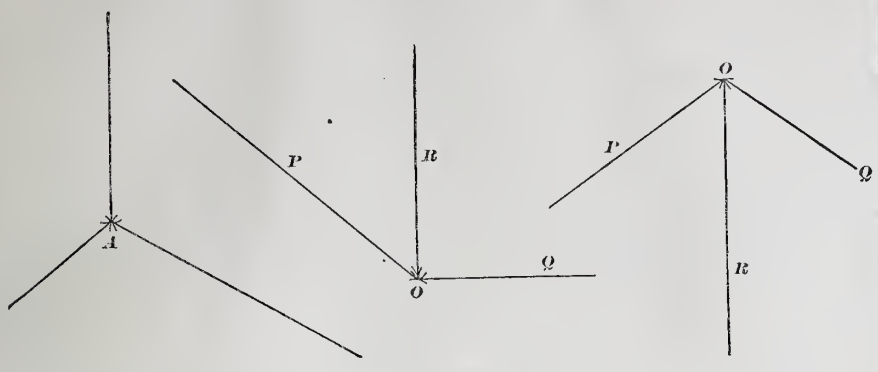


Fig. 4.—*Different Kinds of Strains.*

This leads us at once to the fundamental law which underlies the composition and resolution of forces, viz.: If three forces, lying in the same plane and acting at one point, balance, three lines parallel to their directions will form a triangle, the sides of which will be proportional to the forces. Consequently, when a body, or frame, is kept at rest by three forces acting in the same plane, and any two of them are represented by the sides of a triangle, the third side of such triangle will represent the third force.

As designs for framings are always drawn on paper and to scale, the foregoing gives us the means to obtain the relative proportions of the forces acting upon a frame directly from the drawing, without the trouble of much calculation, and the value of the forces thus obtained will be accurate enough for all practical purposes, being dependent entirely upon the accuracy of the drawing, and also somewhat upon the choice of scale. Let, for example, Fig. 3 represent a frame, B A C, for the support of a load represented by the weight W. To find the strains in the timber-pieces A C and A B, we lay off by some convenient scale $o\,a$ = W, and, as the forces are acting in the axis of the members, we draw the lines $\overline{o\,b}$ and $\overline{o\,c}$, and intersect them by $\overline{a\,b}$ and $\overline{a\,c}$ parallel to A B and A C, respectively. If the frame is at rest under the load W, it is so because the three forces acting at *o* balance; hence these forces will be proportional to the sides of either the triangles *a o b* or *a o c*; that is, the strain in the beam or rafter A B is to the whole load W as the side *a b* which is parallel to it is to the measure of that load, namely, $\overline{o\,a}$. For the strain in the rafter A C we have the measure *o b*.

We see that the triangle of forces would not be changed if both the beams, or either of them, were lengthened; for example, A B to A B¹. If a longer beam of the same dimensions were used, it might prove too weak, not because of any greater load it would have to bear, but because a longer beam offers less resistance to pressure than a short one. Here the second branch of mechanical science, previously mentioned, comes into use—namely, knowledge of the resistance of the materials to different kinds of strains.

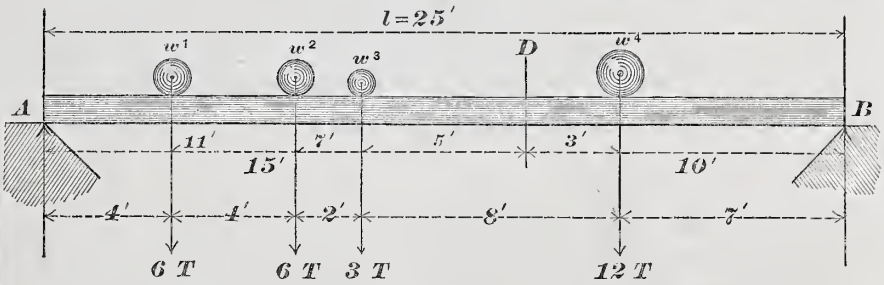


Fig. 7.—*Beam under Partial Loads at Different Points.*

We have said before that the effects of a load are modified by the direction of the supports. By changing the direction of the beam A C to A C′, the triangle of forces *o a b* will be changed to *o a b′*, and the same load, W = *o a*, will now produce the greater strains *o b′* and *o c′* in the beams A C′ and A B or A B¹.

If three members of a frame meet, as at A, Fig. 2 and Fig. 4, the strains to which they all are subject are of the same kind, either all tension or all compression. But, if two of the three members meeting at a common point, O, Fig. 4, are on the same side of the line of the third, they are subject to different strains; the outer members, or those which make the greater angle with each other, having the same kind of strain, and the interior member the opposite strain. Thus, if P is subject to tension, Q is likewise subject to tension, and R to compression, and if R is subject to tension, P and Q are subject to compression. To avail ourselves in trussing of the composition and resolution of forces, it becomes necessary next to ascertain the nature of the forces which affect a trussed frame, and their relations to each other. There are two sets of forces which act upon a frame or truss, viz., exterior forces tending to break or bend the truss, and interior forces which offer resistance to this breaking or bending.

The exterior forces which we shall here

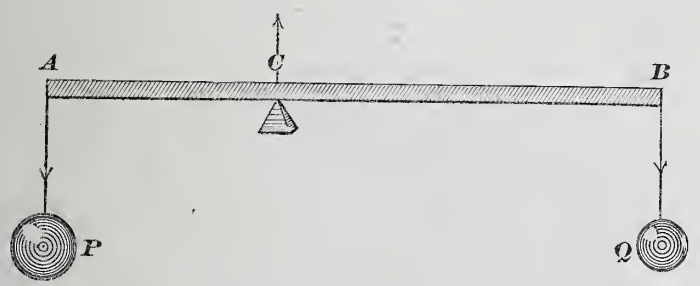


Fig. 5.—*Lever Balance.*

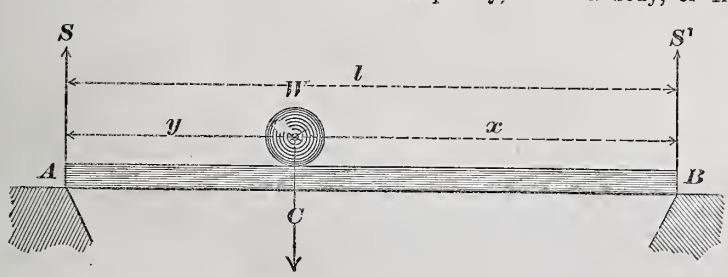


Fig. 6.—*Beam Supported at Ends and Loaded at Center.*

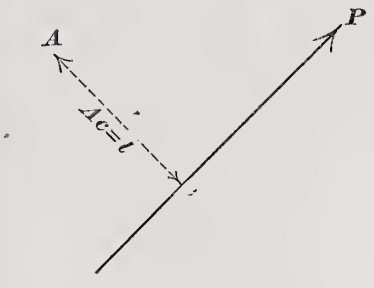


Fig. 8.—*Moment of Force P in Reference to Point A.*

consider as acting upon a truss, are all vertical forces lying in the same plane, and may therefore be resolved into vertical and horizontal components in that plane. These exterior forces are the effects produced by the weight of the truss itself, the load imposed upon it, and the counter effects of the supports, called reactions of the abutments.

The interior forces are the effects of the inherent quality of materials to resist change of form, such as bending, tearing, crushing, &c., and are further modified by the shape or cross-section given to the parts of the frame. We shall in these pages apply the general term "stress" when referring to an interior force, and the term "strains" to the exterior forces.

All questions of strain involved in trussing resolve themselves into mere questions of leverage. The law of the lever is this: "The weights balancing each other at either end of a beam or lever, are to each other inversely as their distance from the fulcrum." By means of this law we are enabled to determine precisely what portion of a given weight resting on a beam—and a truss is merely a framed beam—is sustained by either abutment, and this must be found first before the stresses can be computed.

Suppose a beam, Fig. 5, suspended or supported at C, and loaded at A and B with the weights P and Q. If the beam is to remain horizontal, that is to say, balanced, then, according to the law of the lever, the following proportion between the weights must exist, viz.:

$$P : Q :: \overline{C\,B} : \overline{A\,C}, \text{ hence (1)}$$
$$P \times \overline{A\,C} = Q \times \overline{C\,B}$$

Suppose the beam 36 inches long, $\overline{A\,C}$ to be 12 inches and $\overline{C\,B}$ to be 24 inches, and the weight P to be 10 pounds, then the weight, Q, will be 5 pounds, for

$$10 : 5 = 24 : 12 \text{ or}$$
$$120 = 120.$$

If we now turn Fig. 5 upside down, that is, have the beam supported at the ends A and B, and the load W applied at C, Fig. 6, the stresses will also be reversed, but their relations to each other remain the same; that is, calling the upward reactions of the abutments or supports, S and S′, and the distance of the center of gravity of the load W from the abutments, respectively, x and y, then according to the law of the lever, we have,

$$S : S' :: x : y \text{ and}$$
$$S : (S + S') :: x : (x + y) \qquad (2)$$

but $S + S'$ is equal to W, because the sum of the abutment reactions can be neither more nor less than the load upon the beam, and from Fig. 5 we see that $(x + y) = l$, the length of the beam. Substituting these values in equation (2) we have

$$S : W :: x : l, \text{ hence,}$$
$$\left.\begin{aligned} S &= \frac{W\,x}{l} \text{ and} \\ S' &= \frac{W\,y}{l} \end{aligned}\right\} \qquad (3)$$

which may be expressed in words as follows:

"The reaction of either abutment or support is equal to the whole load multiplied by its distance from the other abutment, divided by the length of the beam." Neither shape of truss, nor any bracing within the truss, can affect this principle. Suppose a beam 20 feet long, loaded with a weight of 12 tons at a point 5 feet from the nearest abutment. What is the reaction of this abutment? *Answer.*—Load 12 tons × 15, the distance from other abutment, and divided by 20, the length of the beam.

$S = \frac{12 \times 15}{20} = 9$ tons; reaction of other abutment, $S' = \frac{12 \times 5}{20} = 3$ tons, $S + S' = 12$ tons. Any number of weights acting upon a beam would have to be treated in the same manner, the sums of their separate reactions being the total reaction or weight supported at the abutments. For example, suppose a beam, A B, Fig. 7, 25 feet long, loaded with the weights $w_1 = 6$ tons, $w_2 = 6$ tons, $w_3 = 3$ tons, $w_4 = 12$ tons, at the distances marked on the diagram, what will be the abutment reaction at A and B respectively?

For reaction at A we shall have:

$$\frac{6 \times 21}{25} + \frac{6 \times 17}{25} + \frac{3 \times 15}{25} + \frac{12 \times 7}{25} = \frac{126 + 102 + 45 + 84}{25} = \frac{357}{25} = 14.28 \text{ tons,}$$

and for reaction at B we obtain:

$$\frac{12 \times 18}{25} + \frac{3 \times 10}{25} + \frac{6 \times 8}{25} + \frac{6 \times 4}{25} = \frac{216 + 30 + 48 + 24}{25} = \frac{318}{25} = 12.72 \text{ tons,}$$

and the sum of the reactions $12.72 + 14.28 = 27$ tons, the total weight supported by the beam.

Any weight or force multiplied by the leverage at which it acts is called the "moment" of that weight or force. The leverage or lever-arm of a force is its perpendicular distance from the point around which its moment is taken. Thus, if A in Fig. 8 be the point or fulcrum about which the force P acts, $A\,c = l$ will be the lever-arm of that force, and $P \times l =$ the moment of P. Since, as has been shown, the forces acting at any given point of a beam or truss do not act in the same direction, and since the tendency of any force acting with a lever is to produce motion, it follows that in order to maintain equilibrium in the beam or truss, the sum of all tendencies to move it in one direction must equal the sum of the tendencies to move it in the opposite direction, or, in other words, the moments of the forces acting upon a body in equilibrium which tend to turn it in one direction about a certain point, must equal the moments of the forces tending to turn it in the other direction, the forces and the point being in the same plane. Taking moments around the point A in Fig. 6, we see that the weight W, acting at the distance or with the lever-arm y from A, tends to move the beam A B downward about the point A, while the abutment reaction S′ at B, acting with the lever-arm l from the A, resists this downward motion. The moment of W in reference to A is $W \times y$, and the moment of S′ in reference to A is $S' \times l$. If, therefore, the beam is to remain in equilibrium under the load W, these moments must be equal, that is,

$$S'\,l = W\,y, \text{ or}$$
$$S' = \frac{W\,y}{l}$$

the same as before in equation (3).

If we desire to find the abutment reaction at B, Fig. 7, by the equality of moments, we shall have

$$4 \times 6 + 8 \times 6 + 10 \times 3 + 18 \times 12 = 25\,B$$
$$318 = 25\,B$$
$$B = 12.72 \text{ as before.}$$

(To be continued.)

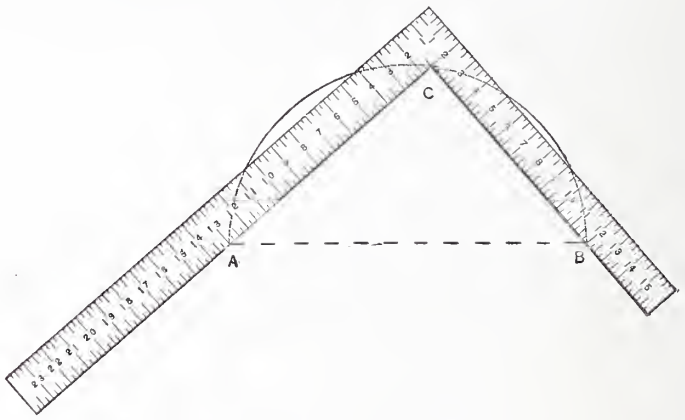
A Singular Harmony of Figures.—The multiplication of 987,654,321 by 45 gives 4,444,444,445. Reversing the order of the digits, and multiplying 123,456,789 by 45, we get a result equally curious, 5,555,555,505. If we take 123,456,789 as the multiplicand, and, interchanging the figures of 45, take 54 as the multiplier, we obtain another remarkable product, 6,666,666,666. Returning to the multiplicand first used, 987,654,321, and taking 54 as the multiplier, again we get 53,333,333,334—all threes except the first and last figures, which read together 54, the multiplier. Taking the same multiplicand and using 27, the half of 54, as the multiplier, we get a product of 26,666,666,667—all sixes except the first and last figures, which, read together, give 27.

CORRESPONDENCE.

As many of our readers are aware, we have a number of letters on hand which have been carried over for some time, for lack of space to publish them. It has been our aim in the conduct of this journal to give prompt attention to every correspondent who saw fit to write us. Of late, however, the bulk of matter thus received has been far in excess of our ability to print, and, therefore, from month to month we are making such selections as we think will please our readers. We are very sorry to disappoint any one, and therefore we refer our readers to the interesting face of *Carpentry and Building* for their recompense for the labor they have bestowed upon it, and trust they will wait patiently until their turns come. The paper is made entertaining and instructive by the voluntary helps that we are receiving from our readers. Should their favors stop coming, it would be noticeable in the pages of the paper, and, therefore, we trust our readers will not defer writing, simply because we have a surplus of matter on hand at this time. Let the stream run full.

Drawing a Circle With the Steel Square.

From N. P., *Vernes, Ill.*—Will you please publish in *Carpentry and Building* a description of the method of obtaining a circle by means of the square? I desire a full explanation as I am a young mechanic.



Drawing a Circle with the Steel Square.

Answer.—A circle of any required diameter may be drawn by means of the square by using it as indicated in the accompanying sketch. Drive two pins or nails, A and B, at whatever distance apart the circle is to have as its diameter. Bring the square against them, as shown, and use a pencil in the angle as indicated in the drawing. This rule is very convenient in many instances. Suppose A and B are two points through which a circle is required to be drawn. By bringing the square against pins or nails placed in the points, it may be described as indicated in the sketch.

Holcomb's Patent.

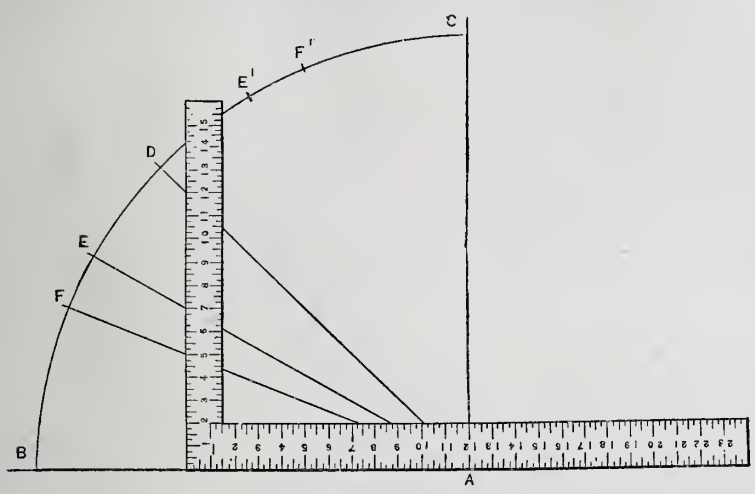
From P. E. C., *Mendon, N. Y.*—I would like to find out something about Holcomb's patent relating to the shingling of hip roofs. I noticed in the March number of *Carpentry and Building* for 1880, that the patent would expire in that year. In January of the present year I shingled two hips in the manner specified, and a few days since an agent called and claimed $10 royalty. The party for whom I shingled the roof compromised the claim for $7. It seems to me this is only robbery. The agent claimed that the patents had been extended. If any one can give me definite information upon this subject it will be a favor.

Note.—It is possible that the statements of the agent with reference to the extension of the patent are entirely correct, but our attention has not previously been called to anything of the kind. In any event, no careful business man would pay a demand of the kind referred to without being fully assured of the justice of the account. If any of our readers have information on this point we shall be glad to hear from them.

Rafters for a Third Pitch Roof.

From S. O. E., *Evergreen, La.*—I thought last September, when D. M. W. commenced cutting those rafters for a third-pitch roof 18 feet wide, that he would never get the job done without help. As J. H. M., J. E. W., W. A. E. and L. P. B. have each cut a pair, and all of different lengths, and as D. M. W. says in the December number that he was wrong in his conclusions and believes that the others are also wrong, I feel that I ought to try to help the poor fellow out of his trouble.

First let us ascertain what third-pitch, quarter-pitch, &c., mean. Referring to the inclosed sketch, draw A B and A C at right angles. Describe an arc, as shown, from A as center. Divide the arc in three equal parts, as indicated by E and E'. Draw E A. Then, by placing the square as shown, we find that third-pitch, or a hexagon miter, is 7 inches to the foot instead of 8 inches, as some suppose. Divide the arc in four equal parts, as shown by F D F', and drawing F A and D A we find that quarter-pitch, or the octagon miter, is 5 inches to the foot, and that half-pitch, or square miter, is 12 inches to the foot. From this, by the rule of square root, it will be found that the length of rafter on an 18-foot building for third-pitch is 10 feet 5 inches.

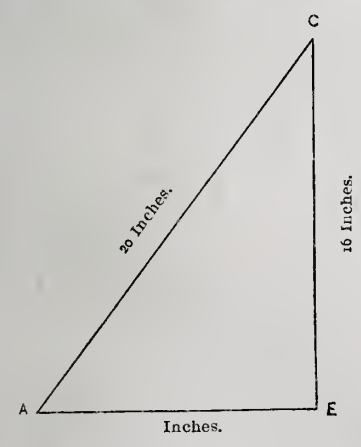


Rafters for Third Pitch Roofs.

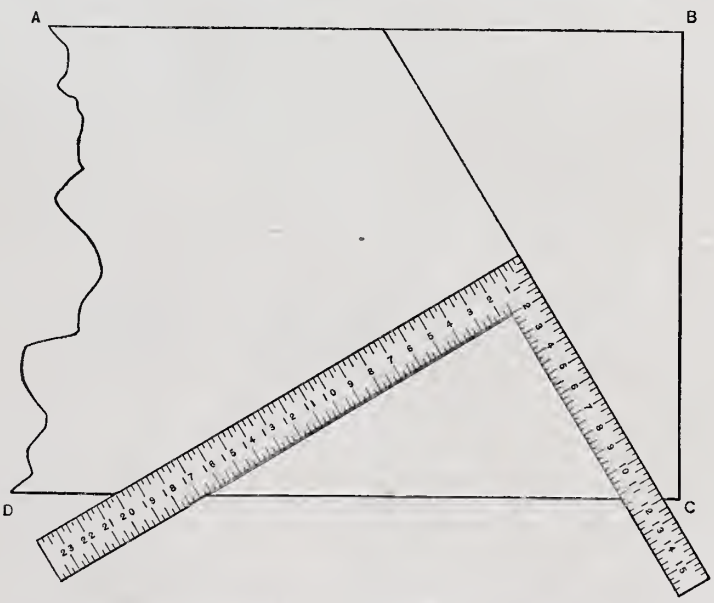
Hopper Bevels by the Square.

From J. G. M., *Nashua, N. H.*—I have been somewhat interested and a little amused at the different methods of obtaining the bevels for roofs, and more especially for hoppers. The different ways are all well enough since they end in the same result. How much easier, however, can the same be obtained by the use of the square. There is not a bevel in any roof, or in a hopper of any shape or inclination, that cannot be obtained with a common square and rule. If we wish to make a brace we take the run on one arm of the square and the rise or hight on the other. We mark by the edge of the square for the bevels. Let us apply the square to obtaining the bevels of a hopper.

Suppose it is desired to construct a hopper, the sides of which are 20 inches wide, with a run of 12 inches and a rise of 16 inches, all as indicated in Fig. 1 of the sketches. Let A B be the run, B C the rise, and A C the inclination or side of the hopper, or in other words, the width of the board. Now for the bevels. For the side cut, or cut across the side of the board, take the width of the board, A C, of Fig. 1, which, as we have supposed, is 20 inches on the blade and the run A B (12 inches) on the tongue. Mark by the tongue of the square, as shown in Fig. 2. In it A B C D represents the board with the square laid across it so that figures 12 and 20 shall come to the edge of the board. For a butt joint take the width of board 20 inches on the blade, and have the run 6 inches on the tongue. Put these figures on the edge of the board and mark by the tongue of the square. For a miter joint take the width 20 inches on the blade and the rise 16 inches on the tongue. Then the tongue will give the required bevel. This completes the bevels for one end of the board. Mark off the length of one side of the hopper on the edge of the board, and mark the other end the same. Then the board is ready to saw.



Hopper Bevels by the Square.—Fig. 1.—*The Dimensions of the Required Hopper.*



Hopper Bevels by the Square.—Fig. 2 —*Manner of Using the Square.*

It is well to understand the method of drafting hoppers and obtaining the bevels by means of a drawing, because the principles may often come in play in making plans. For practical uses, however, there is nothing better or more reliable than the square. The square can, in like manner, be applied for obtaining any and all the bevels in roof framing, and for many other different, yet practical, problems.

Painting Moldings.

From W. S. H., *Lewisburg, Penn.*—Can you not give the readers of *Carpentry and Building* some idea of how the washboard moldings and window casings of the room should be painted in order to match the wall paper? I have just been re-reading your article on wall paper in a previous number of *Carpentry and Building*, and I think that there should be harmony of color in the woodwork of a room in order to harmonize with wall paper,

Answer.—Our correspondent's question is short and to the point, and we wish it were possible for the answer to be as direct. Unfortunately, from the very nature of the case, this cannot be. The painting of moldings and washboards so as to match the paper, must be as various in tone and shading, and have as little relation to rule as has the selection of the paper itself. Perhaps one of the most satisfactory ways of settling the question would be to take some one principal shade of the paper, preferably one of the dark ones, and then make moldings and washboards of the same character, but somewhat darker. In other words, to make moldings and washboard harmonize with, but considerably darker than, the paper itself. Thus, for a paper which inclines to red, we have a deeper red or brown for moldings and washboards. In general a warm color will go well with all the papers now in use, but by this we do not mean a brick-red. If the carpet does not fit the room, or is not carried out into every irregular corner, these corners can be very nicely covered by painting them black and giving them a coat of varnish; they then form a sort of foundation for washboards and walls. A dark olive green can be used in a great variety of cases to form a baseboard, and it might even be carried upon the window moldings. The moldings in general may, however, be made light with advantage. One thing, however, must be guarded against, and that is, making the house too dark. It is very fashionable now to have dark paper, dark moldings, dark carpets, and to paint the floor around the carpet-edge black. If this is carried to the extreme of the fashion, the result is a dreary, gloomy room, which never seems to have light enough, and at night is but little better than an underground cavern. It would be a difficult thing, if not altogether impossible, to suggest satisfactory shades for painting to one who had not a good, or at least, a fair idea of color. A natural knowledge and appreciation of it is one of the necessities of successful painting. On this account we think it would be well in most cases to consult the lady members of the family in regard to those colors which would give the best results with the wall paper. Feminine taste is in the majority of cases a most critical and a most correct one, and men are rarely misled when they depend upon it. If they are asked to select tints for moldings, baseboards and window frames which shall

harmonize with the wall paper, they will not be at a loss to select the shade. Where a dado paper is used, it will of itself indicate a good color for the baseboard in the darker colors of its lower portion. This need not necessarily be used for the molding.

Ventilation.

From A. P., *Galva, Ill.*—I take the liberty to ask a question concerning ventilation, a subject upon which there appears to exist a vast amount of ignorance. I have always been taught, and have firmly believed, that impure air rose to the ceiling or upper portion of a room, and that cold and pure air remained at the floor. I find, however, that persons of intelligence hold opinions directly opposite, and claim that to relieve a room of bad air ventilators should be placed in the base, because the bad air settles toward the floor. From this it would appear that somebody is very ignorant. Either I have lived fifty years without knowing anything about ventilation or others have much to learn. Will you give some attention to this subject through the columns of *Carpentry and Building.*

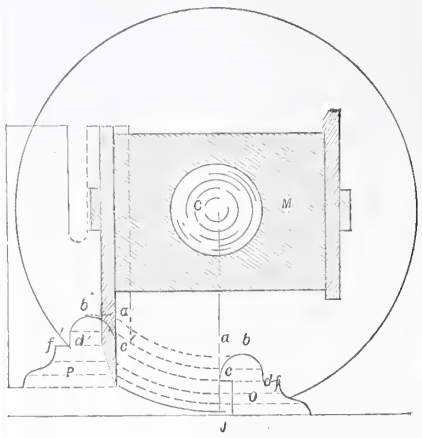
Answer.—The general subject of ventilation is a very complex one, and it is difficult to lay down such general rules and principles as may be followed in all cases without exception or variation. Under the very simplest conditions the proper method of ventilation is undoubtedly to take the foul air from the top of the room. This is upon the supposition that the emanations from the human body, including the breath, being somewhat warmer than the surrounding air, would rise, and, therefore, the room should be relieved of its bad air near the top. When, however, we come to the heating of a room that is to be ventilated, the conditions are somewhat changed. Supposing that the room is warmed by a register from a hot-air furnace, it is evident that the hot air upon entering the room will rise at once to the ceiling. If the ventilation be from this portion of the room, the purest air, because it is the last that has entered the room, and the hottest, will be drawn off, while that which has been in the room some time, and has become cooler, although it may be foul, will be driven toward the floor. In this case if the opening for ventilation be made near the floor, and at a proper distance from the register supplying pure and warm air, the tendency will be to draw from the room the bad air which is forced to the floor, and to warm the room more evenly. In houses which are tolerably well heated it is not unusual to find a space near the floor cold, clammy and quite uncomfortable. Sensitive persons complain of cold feet. By drawing the bad air from near the floor, and allowing the fresh warm air to ascend to the ceiling in the most natural direction and forcing the bad air out, and gradually taking the place of it near the floor, the room becomes more evenly heated, and the difficulties complained of by sensitive people are in a measure overcome. We have not space, at this time, to enter exhaustively into a consideration of the subject of ventilation, which, as we have already remarked, is a very complex one, and one concerning which the doctors very frequently disagree. We think we have in these few remarks pointed out such principles as will enable our correspondent to reconcile the apparent differences between the opinions which he holds and those which he has met in others. There are a number of good books published on the general subject of ventilation, some of which it might be interesting to our correspondent to peruse.

According to Carpentry and Building.

From J. G. S., *Paris, Arkansas.*—The house contracted according to plans and specifications of *Carpentry and Building*, in the December number, 1881, mentioned by a correspondent a short time since, is not the first instance in which the journal has been used for that purpose. My own dwelling-house, which I had erected last year, is according to a plan found in your valuable paper, and, with the exception that the rooms were made larger and higher, it was executed according to the design as published. The design in question was the one receiving the second prize in the first competition.

Designing Molding Knives.

From A. S., *Lima, Ohio.*—Draw the line of the bed-plate at the actual distance from the center of the head. Draw the face-line of the cutting iron also at its real distance from the center of the head, and at right-angles to the bed-plate. Draw the line C J in the sketch parallel to the cutting iron through the center of the head. On the bed-plate, in the position shown, draw the



Designing Molding Knives.—Fig. 1.—*Rule Submitted by A. S.*

outlines of the required molding. Parallel to the bed-plate draw lines *a b e f* at as many points as may be required. From the center C of the head, strike arcs from points in the line C J, where measuring lines drawn through the molding meet it, continuing them until they meet the line of the cutting iron, as shown. From the points thus established in the cutter, draw horizontal lines, as indicated in the sketch, corresponding to the measuring lines in the profile of the molding. In length make each of these several lines the same as the corresponding line in the molding. Through the points thus obtained trace a line which will be the shape of the required knife. I have used this method for finding the shape of bits for shapers and heads on vertical shafts, and it has always given me satisfaction. The distance to the assumed bed-plate is always the distance to the face of the member furthest from center of the head. In conclusion I would say

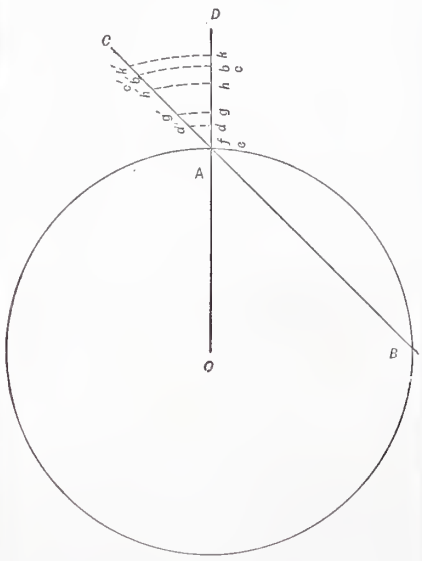


Fig. 2.—*Rule used by B. F. D.*

that I am indebted to Moncton's "National Carpenter and Joiner" for the principles upon which this method is based.

From B. F. D., *Lima, Ohio.*—Strike a circle equal in diameter to the cutting points of straight knives when in the head. Then set the end of head on the circle, and mark the under side of the knife, as shown by A B in Fig. 2. Extend this line in the direction of C. From the center O draw O A, extending it in the direction of D. Draw the molding and the line *c c* parallel with the under side of the molding, and through the highest point of it. Divide the profile into as many points as may be necessary in obtaining measurements, and through these points erect perpendicular lines, as shown in the sketch. Draw *e' e'* in the plan of knife pattern corresponding to *c c* of the molding. Take the distance *e k* in the plan of molding and set it off from A to *k* on the line O D in the plan of the cutter-head. Then, with O as center and O *k* as radius, describe an arc, extending it until it cuts the bevel line B C in the point *k*¹. Take the distance A *k*¹ and transfer it on the line *e' k'* of the knife pattern. Continue in this way until the several distances *e' d'*, *e' f*, *e' g*, have been determined in the same manner. Then a line traced through the points thus obtained will be the profile of the knife required to cut the given molding. I have drawn hundreds of patterns in this way, and the plan has the merit of being easy of use. I keep a board with the plan of head drawn upon it for each machine, and can, on demand, draw almost any knife required in five minutes' time. I have never seen this method employed by any one, and therefore trust it will be of interest to the readers.

From G. B., *Cincinnati, Ohio.*—Referring to the diagrams published in the April number of *Carpentry and Building*, showing how to obtain the form of molding knives, I would say that I think the plan given by F. H., Albany, N. Y., is the only correct one submitted. I inclose a sketch showing how

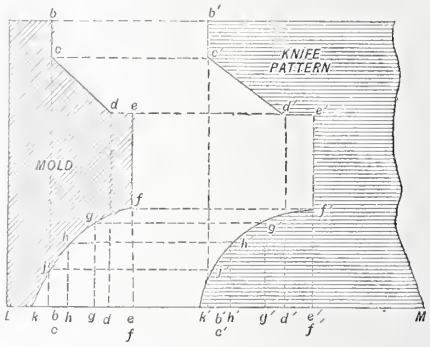


Fig. 3.—*Application of the Rule Illustrated in the Preceding Cut.*

I obtain the pattern of the knife. The principle is exactly the same as that presented by F. H. I think a great many of your readers will be interested in knowing how to construct the rule, which I have found greatly facilitates the work of making patterns for molding knives.

I first make a circle, A A, equal in diameter to the size of head. I then draw a line perpendicularly through the center, as shown by C B. I next get the distance from the center of head to the highest, cutting point of the knife D K. From K, I draw the line D E, touching the circle A A, as shown in the sketch. This will be the angle on which to lay off the rule. I next place a common rule as shown at K B in the drawing. Then with the compasses set at C as center, I draw arcs through divisions of the rule cutting the line D E. I square up from this line through the points thus obtained, thus completing the rule, as shown at K E. The theory is that no two points on the knife, measuring lengthwise, cut on the same angle. Fig. 5 shows an application of this method.

Cracking of Plaster.

From G. W. G., *Urichsville, Ohio.*—In the March issue a correspondent desires to know the causes of cracks in his plastering. I have followed plastering for 14 years, and have found causes too numerous to mention. A few, however, may be named. In the first place, we plasterers are not given sufficient time in many cases to get our material in proper order. Mortar should stand at least 10 days or two weeks after the lime is run off into the box. In the second place, an insufficient quantity of hair is used. Perhaps the tender does not like to work so hard as is required to get the hair well mixed. A very great source of trouble in matters of this

kind is the way the walls themselves are put up. The walls of a 10-foot story should be well bridged in two places between the floor and the ceiling. Two rows of bridging should be placed in every ceiling over 12 feet wide. Cracks may be prevented in the corners of rooms by spiking a 2 by 4 solidly on to a 4 by 6 piece, thus making a solid corner 2 inches deep in which to lath. In constructions of this kind there are nine chances out of ten that no cracks will appear in the corners. From experience I contend there is nothing in the way the work is done, so far as raking or brooming is concerned, or in letting the first coat dry before coating the second time. I have tried a great many different plans, both in preparing the material and in putting it on. I firmly believe that the cracks are entirely due to the preparation of the mortar and of the walls to receive it.

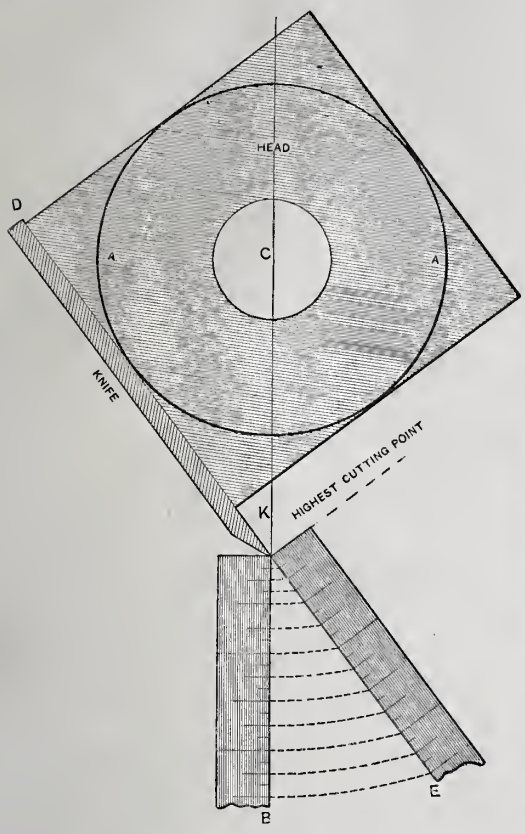


Fig. 4.—Method employed by G. B.

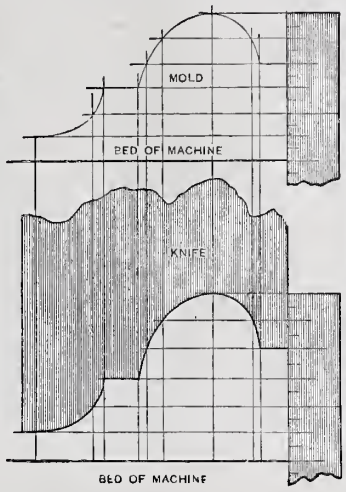


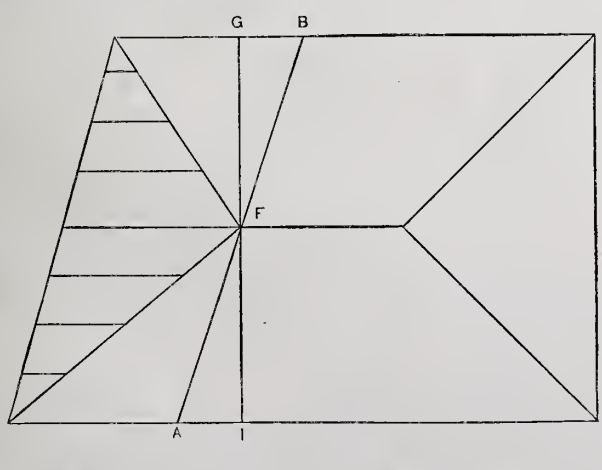
Fig. 5.—Application of the Foregoing.

Designing Molding Knives.

Bevels of Jack Rafters.

From G. W. L., Jr., *Norwich, Conn.*—I have a copy of Bell's "Art and Science of Carpentry Made Easy." While I regard it as one of the best works of its kind which I have ever seen, I am sure there is at least one great error in it. The copy I have is of the edition of 1868. I have never seen any other, but if later editions have been issued perhaps the error has been corrected. In my book there is a plan of a trapezoidal hip roof, similar to the inclosed diagram, excepting the line A B. It is stated that no two of the jack rafters on the oblique end of the frame have the same pitch. If this be true, of course it is necessary to obtain the down and lower bevel of each rafter separately. The author explains the method of doing this, basing his calculations on the supposition that if the rafters were oblong they would come in contact with a ridge ball located directly over G F I, in a parallel direction and at the hight of the roof. I claim that if the rafters were oblong they would come in contact with a ridge ball located directly over A F B, in a parallel direction and at the hight of the roof, A F B being parallel to the oblique end of the frame. If I am right the rafters are of one pitch, and consequently of like down and lower bevel.

Note.—Our correspondent is correct in his conclusions. We have often had occasion to point out this error in the work mentioned.

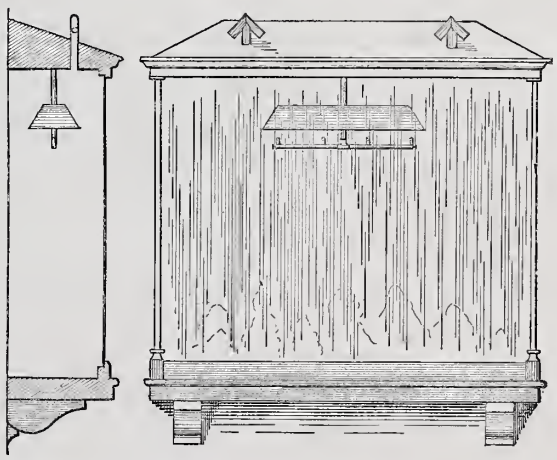


Bevels of Jack Rafters.—Diagram Accompanying Letter from G. W. L., Jr.

Ventilating Show Windows.

From A Subscriber, *Montreal, Canada.*—Will you please give room in your valuable journal for the discussion of the following question? I wish to know the best way to ventilate a show window of the store so as to keep the outside glass from becoming frosted in the winter time. The light is furnished by gas.

Answer.—The presence of frost upon show windows in our northern climates is a very serious question, and one which is very rarely made with entire satisfaction. The difficulties to be overcome are those of lighting, and at the same time penetrating, the deposition of moisture upon the outside of the window. We think that some of the requirements are to cut off the inside of the window entirely from the body of the store; to keep both sides of the outside plate of glass equally cool; to carry off the gases produced by the gas-burners as rapidly as they are made, by a flue connecting directly with the outside air; to supply the air for the burners by a direct connection at the bottom of the show window with the outside air. The accompanying cut gives a rough idea of the manner employed in ventilating many store windows in this city. As the windows often project a little from the building, the small ventilators are put above the cornices, and in some cases carried down to the reflectors under which the gas-burners are placed. Holes are often made into the pipes to take the emitted air out from the top of the window. At the bottom of the window other provisions are made for allowing cold air to pass into the window. Of course, when the window is treated in this way nothing which is liable to injury from cold can be placed in it.



Ventilating Show Windows.

Hopper Bevels.

From D. B. M., *Lewisburgh Pa.*—If all the correspondents were as concise as H. McG., their communications, I think, would give more satisfaction to young carpenters. Of all that has been printed on hopper bevels, I think this correspondent's method is decidedly the best. It is all compressed in a nutshell.

Answers by Mail.

From P. B. M., *Amagansett, N. Y.*—Inclosed please find stamp for answer by mail, as I expect to require the information before

it can be published in *Carpentry and Building*. If you make any charge for information of this kind, please state the amount and I will remit the same.

Note.—The above is a fair sample of many letters which reach us, and we publish it for the purpose of making known our position in matters of this kind. We are always ready to serve our readers to the extent of our ability, but the magnitude of our correspondence is such that we cannot permit it to be so greatly extended as would result from an attempt to answer inquirers by mail. Further, the special object we have in view in answering inquirers at all is to further the interests of the paper, and therefore, to reply by mail iustead of through the columns of the paper, would detract materially from the interest centering in it. Very few questions in connection with the building trade cau be proposed by an individual builder or mechanic which are not of equal interest to a very considerable class, and therefore, in answering them through the paper, we serve the class as well as the individual. We make no charge other than the subscription to the paper for any information that we can furnish our readers in this way, and we caunot undertake to answer questions by mail, even if a fee be teudered. In addition to this, we would remind our readers that answers from practical men in the trade, which their inquiries published in our columns frequently call out, are of greater value than such answers as we might give. We urge our subscribers, therefore, to use our columns freely in making known their wants, but to save us the trouble, so far as possible, of writing personal letters explaining why we cannot answer their inquiries by mail.

Hand-Power Wood-Working Machine.

From F. S. W., *Cleveland, Ohio.*—To such of your readers as may desire to build a light sawing machine, to run by hand, the following description of one which I constructed for my own use some time since may be of service. The entire cost of the machine was in the neighborhood of $50. Fig. 1 represents a side view of the machine and shows the location of tho several wheels employed and the crank by which it is driven. By means of the large and small gear-wheels by which power was communicated from the crank-shaft to the shaft carrying the fly-wheel B, it will be seen that speed was somewhat augmented. Tho fly-wheel B was mado of pine and fastened to the shaft by means of an iron flange. The rim was broad enough to carry a 3-inch belt. C, in this figure, is the driving pulley which runs the circular saw, being connected with the saw pulley by a 2-inch belt. An end view of the machine is afforded in Fig. 5, from which it will be seen that the shaft on which the driving pulley just mentioned is placed is also used for running a jig-saw. The speed of the jig-saw is about 800 strokes per minute. At the same rate of motion the circular saw makes about 3200 revolutions per minute. The frame of the machine was made in four bents of 1⅜ inch pine, framed together with tenon and mortise. The first three bents had a beam across the top 12 inches deep. The fourth bent at tho left, standing behind the saw, has a lighter beam across the top, being 1⅜ by 3½ inches. This is also the size of the lower beams and the uprights. The four middle uprights do not touch the floor, but only reach to the bottom of the lower beam. The several bents are fastened together by 1⅛-inch bars let in and screwed on across the ends of the bents.

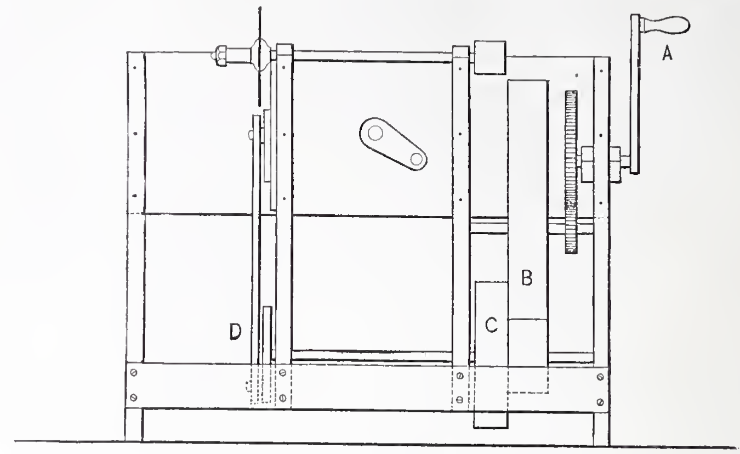
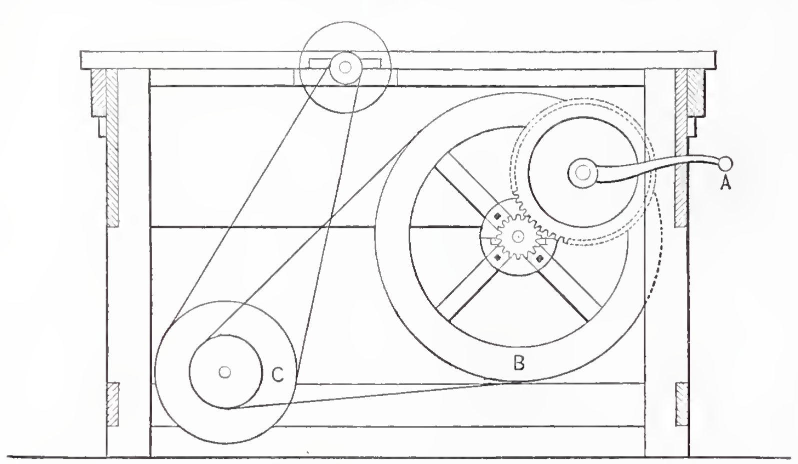


Fig. 2.—Rear View of Machine.

Fig. 2 is an end view of the machine, taken from behind the saw. It may also be regarded as a cross-section. It shows the lengths of shafts and location of pulleys. A is the crank, B the fly-wheel, C the driving pulley, and D the pitman of the jig-saw. This pitman is made of hard wood. After boring holes for the pins, it was sawed in two parts, and fastened up with four screws, one ou each side of the pins. By simply drawing the screws it may be detached when not in use. The wheel which runs the pitman is of iron, made light in the center with a heavy rim. All shafts are made of ¾-inch steel, and run in babbitted wooden boxes. The saw collars have cuts to receive knives similar to those employed in a variety molding machine. By this means a variety of small molding work may be done upon this machine more conveniently than by hand. To allow for the spread of the collars, the distance to the nut is usually filled by a wooden washer of suitable length, as shown in Fig. 1. The saw table is raised or lowered by a peculiar arrangement shown in Fig. 5. It consists first of a sliding frame mado of 1⅛-inch pine, placed underneath the table, and mado to slide up or down upon inclined planes, one of which is located at each corner of the machine. These inclined planes are simply cleats screwed on to the inside face of the two outside beams. Upon these a triangular piece of wood, which is fastened to the frame above, slides. The frame is drawn up or down by a screw, which, with its crank, is placed at the back of the machine. This was made of parts of an old hand-screw. Where the shoulder of the screw rests against the back of the cross-bar, it is protected by a brace-plate to prevent wearing. On the outside of the cross-bar a wooden washer is fastened to the screw, so that it may push as well as pull. The nut of the screw is fastened to a horizontal piece of wood about ½ inch thick and 3 inches wide. This, at its further end, is toggled to an upright piece which is fastened to the flat cross-bar of the sliding frame. This upright piece has on its lower end a tenon which fits loosely into a mortise in the horizontal bar, and is pinned to it with a ½-inch pin, which is screwed on to the top of the end of the horizontal bar.



Hand Power Wood-working Machine.—Fig. 1.—Side View.—Scale, ¾ Inch to Foot.

The saw table is made of 1⅜ inch pine glued together and fitted with a hard wood bed-piece for the saw. The face of the bed-piece is shown in Fig. 4, the longitudinal section in Fig. 5. It can be taken out to change the saw. At each end of the table is fastened a cross-bar 1⅜ by 4 inches, screwed to it with two screws let in from the top. The ends of these cross-bars are seen in Figs. 1 and 5. At the front and back ends of the table, and as nearly as possible in a line with the saw, an upright piece ½ by 2 inches is fastened to the machine and gained with the cross-bar of the table. This guides tho table as it is raised or lowered, and being on a line with the saw, the shrinkage of the table does not affect the cut iu the bed-piece. Figs. 3 and 4 show the table-top and movable gauge and fence for ripping or cross-cutting. The rip-saw gauge has three sets of holes in the table provided to receive suitable pins from the stationary bar of the gauge. The sliding bar of the cross-cut fence has a tongue on the bottom which fits into a groove in the table. An opening is also made in the table for the pulley which runs tho saw.

The sliding piece which holds the lower end of the jig-saw is made of hard wood, and is ¾ by 2 inches in size and 6 inches long. The driving pin is placed in the center. In the upper end of the piece is a slit to receive the saw, and a hooking cut crosswise of this to catch the pin of the saw. The edges of this piece are beveled from the back to fit in a dovetail sliding-way. The back of the sliding-way is also of hard wood, with two beveled strips screwed on to the face to form the dovetail. The upper rigging of the jig-saw is also mostly of wood. The upright post, as shown in Fig. 5, is braced and hinged at the top to fold up against

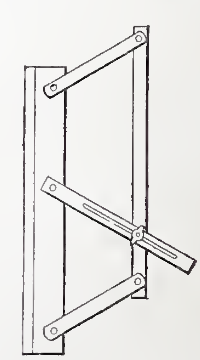


Fig. 3.—Ripping Gauge.

the ceiling when not in use. Behind it is a brace, not shown in the illustration, which is attached to the post at its lower end by a hinge which is above the top of the groove which receives the bar of the sliding foot. The top end of the brace hooks on to a pin when in place; when not in use it folds up with the post. The sliding foot is raised or lowered in the usual manner, being fastened by a thumb-screw on the back of the post when it rests in a shallow groove. The saw-rest is made of three bits of hardened steel. One is set into the face of the wooden foot-piece. Against this the back of the saw rests. Two other pieces are screwed on over

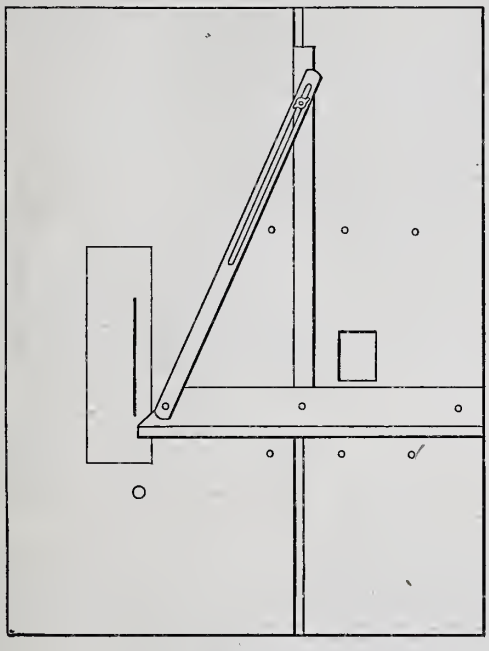


Fig. 4.—Plan of Table, showing Position of Saw, &c.

this with an opening between them to receive the saw. They are made slightly movable to adjust them to saws of different thicknesses. When in operation the saw is drawn up by a heavy piece of rubber webbing, about a yard long, fastened at the top by a cross-bar screwed on over it. At its lower end is fastened a hook which holds the upper end of the saw. It is made of a heavy piece of sheet brass with a cut in the center, and bent up to hold the cross-piece of the saw. I have found the rubber webbing to work very nicely. It will draw the saw at the rate of 1000 strokes per minute.

Note.—Some time since we inspected the machine which our correspondent has here described, and which he explained to us had been built at a time when he was unable to buy the machinery required in his business. In features of design and construction it seemed to us quite a curiosity, and thereupon we suggested to him the scheme of describing it in the columns of *Carpentry and Building*. In this age of ready-made machinery, very few inventors give their attention to articles of this kind, but, nevertheless, a description of what has been accomplished in this line cannot fail to be of interest to many of our readers. Viewed simply from an amateur's standpoint, there is that in this which would give a man pleasurable employment, should he set about duplicating it, for a considerable period of time. After the machine is constructed he would have something which would do good work, and such a variety in kind as to be quite useful in his shop. However, we present the description more as a curiosity than because it is of practical application.

Camber in Howe Trusses.

From V. A. P., *Joliet, Ill.*—In answer to Waltham's inquiry, "What gives the camber in a Howe truss?" I will say that it is framed in by making the top chord longer than the bottom chord. Take, for example, a bridge of 150 feet span, which you wish to camber 3 inches. Make the top chord 3 inches longer. The increase in length should be divided equally between the several panels into which the span is divided. The truss described by H. McG. would camber down as well as up. The principal braces and counter-braces are all cut the same length. I would advise your correspondent Mickey to buy a book or join a bridge gang before he attempts to answer questions of this kind again. I suggest further to H. McG. that he has a clear case against his boss for not teaching him the trade in all its branches, and I advise him to prosecute.

From S. J. C., *Jefferson, Ohio.*—I would like to correct H. McG.'s statement with regard to the camber of a Howe truss. It is framed in by spacing the length of panels on the lower chord shorter than on the upper one, and shortening the last counter-brace at the end so as to allow the plumb-posts to stand vertically. The same thing may be accomplished by shortening the counter-braces gradually as you approach the ends.

From C.—In the January number I noticed that Waltham desires to know what gives the camber in a Howe truss. As I am a new reader, I have hesitated to express myself upon this point, but when H. McG. said that it had been a long time since he shot off his mouth, and then proceeded to fire away in the dark with regard to lengthening the braces or studs, it seemed to me that I was justified in writing also. He neglected to state one important feature, that is, whether the braces are to be lengthened as they approach the center or the ends of the truss. I hold that the braces shorten as they approach the center, and that by screwing up the rods until the braces come to their places the desired shape is attained. I have another plan that I consider very desirable for the purpose. By making the top chord the longest, and framing the spaces between the braces from one-eighth to three-sixteenths longer at the top than at the bottom, the braces will be all of one length.

From W. G. C., *Danville, Ill.*—The information furnished by H. McG. regarding the camber of a Howe truss, is not in accordance with that found in any of the books to which I have access. Neither is it in accordance with practice, so far as I can ascertain. Your correspondent may be an intensely practical reader, but he certainly is mistaken with regard to this "nonsense," as he terms it. Camber is framed in a Howe truss by either making the panels longer on the top chord than on the lower chord, and lengthening the diagonals, or by shortening the panels on the lower chord. The latter method is usually employed. I advise H. McG. to study up the subject of Howe trusses.

Cypress Timber.

From DAVID C. BARROW, JR., UNIVERSITY OF GEORGIA, *Athens, Ga.*—If your Louisiana correspondent who wishes to know the strength of cypress timber will send a few pieces to this Institution, they will be carefully tested and the results furnished to *Carpentry and Building* for publication. Pieces to be tested for transverse strength should be 1 inch square and not less than 14 inches in length. For crushing strain they should be 1 to 2 inches square and 4 inches in length. For tensile strain 2 inches by ½ inch and 14 inches long. There is no cypress in this vicinity or I would take pleasure in furnish-

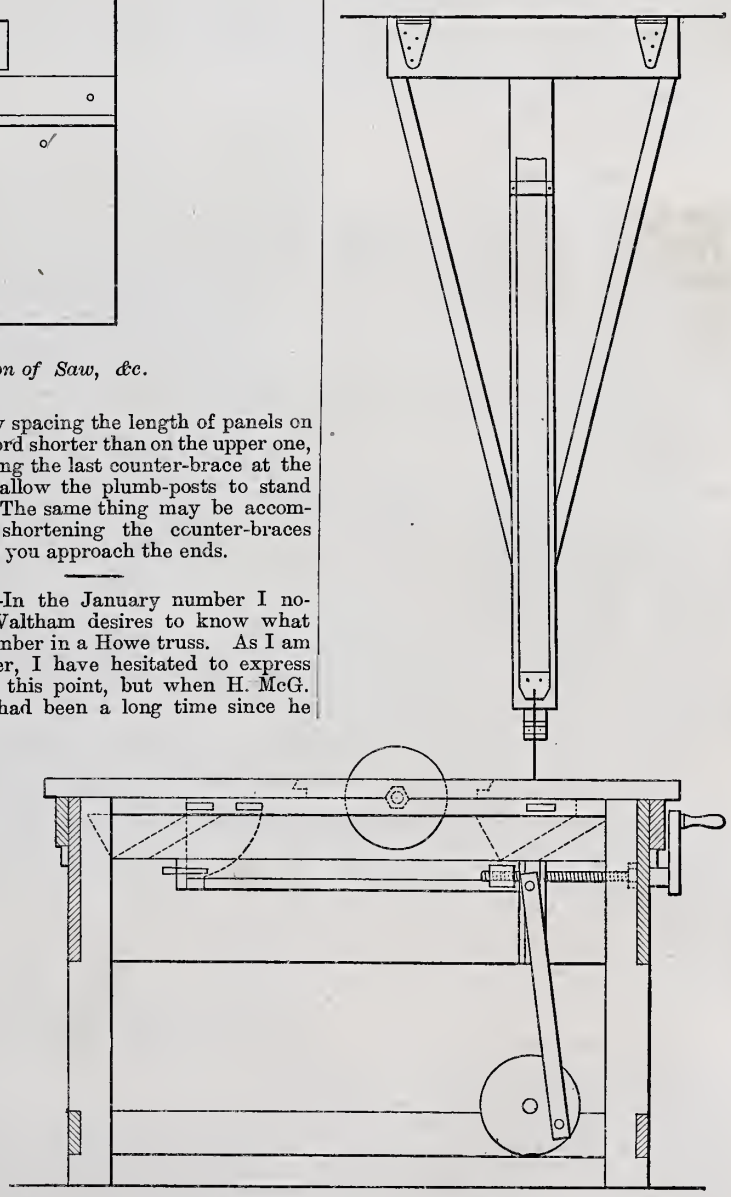


Fig. 5.—Side View of Machine Opposite to that Illustrated in Fig. 1, showing Jig Saw Attachment.

ing my own samples and forwarding results of tests as proposed.

Note.—Our readers generally should feel under obligations to an institution which offers to answer in a practical manner questions of this character, and we trust our correspondent who originally proposed the question will avail himself of this generous proposition, not only for his own benefit, but for the advantage of our readers in general. We need scarcely remind him and others who may feel disposed to correspond with the University of Georgia, that all samples submitted should be sent charges prepaid.

REFERRED TO OUR READERS.

Repairing Old Walls.

From P. B. M., *Amagansett, N. Y.*—I have a customer who is the owner of a 12-room frame house, the walls of which are terribly cracked in various directions. In fact, the walls look as badly as the walls in the house in which I am at present living, and which has been built upward of 40 years. My customer's house has been built only five years. The mortar appears to be perfectly solid on the laths and well clinched. The question is, what remedy is there, if any, for this difficulty? Can the walls be repaired, leaving them in good shape and of fair appearance without taking off the plaster, cleaning the lath and replastering? The house in question is one with which I had nothing to do in the erection, but I have been requested to undertake the repairs.

Brick Machines.

From J. R. L. *Chester, S. C.*—I would like to hear, through the columns of *Carpentry and Building*, the experience of some of the practical readers of the paper concerning brick machines. The manufacture of brick is an important item in house construction, and as brick machines are being introduced, it seems to me important that contractors and builders should know something of their merits. I think information in this direction will be of general benefit to many of the readers of the paper.

Design for a Dairy Farm House.

From W. W., *Blue Earth City, Minn.*—Will some of the Eastern readers of the paper furnish a good design for a dairy farm-house? I think the publication of such a design would please more than one of the Red Hatchet boys of the West. We are badly in need of something of this sort, and accordingly will be very much obliged to our Eastern friends for the favor. The house should be cheap, as $1000 is about all a Western man can stand at present.

Paste for Hanging Paper.

From G. H., *West Stockholm.*—In paper-hanging, the paper sometimes will dry spotted, especially if it be of very light color. What is the best paste for use with wall paper and how should the walls be treated before the paper is applied? What is the best kind of tools for use in hanging wall paper? Can some one give a drawing of a table that is convenient for this purpose?

Designs for Brick Houses.

From G. H. E., *Holyoke, Mass.*—A great many designs for frame houses have been published in *Carpentry and Building*, but, as yet, I fail to see any of brick. Will not some of the practical readers of the paper contribute in this direction? I desire a house of about eight rooms, to be built of brick, and not to cost over $2500. Can some of my fellow readers supply this want?

Stone Smoke House.

From C. M. P., *Haden, Minn.*—Will some of the readers furnish me detail plans of a stone smoke-house, with fire-room and smoking room separate? I think the fire-room should also be an ash-room for the deposit of ashes from the house. Perhaps some one can suggest a better idea. I do not want the building to be a very expensive one.

STRAY CHIPS.

THE MAIN PORTION of the court house in Allegheny City, Pa., was destroyed by fire on Sunday, May 7. The building was so badly damaged by fire and water together that, in the opinion of competent builders, it will be necessary to erect an entirely new building. The loss by fire is set down at $75,000, with insurance at about $62,000. The building destroyed was built to plans prepared by Mr. John Chislett, architect. The contract was let in 1838 and the building was completed in 1841. Mr. Jacob Vodges was the carpenter in charge. The original cost was $260,000. The building was a beautiful structure in the Doric style of architecture, and built of stone, although, unfortunately, a very poor quality of the latter was employed. The structure was surmounted by a dome and lantern that gave it a lofty appearance and caused it to be admired by all who saw it.

EVER SINCE the Capitol was finished at Albany, the newspapers have contained more or less gossip concerning defects in the construction, settling of piers and cracks in the ceiling. The seams and cracks in the stone ceiling of the Assembly Chamber, and the fractures in the granite slabs and arches in the corridors beneath, have received careful attention from a sub-committee who have been investigating into the construction of the new Capitol. These cracks were first discovered two years ago, and were at that time attributed to the settling of the foundations of the buildings. The architect felt confident that they would not increase. In spite of paint and putty, however, the seams are wider at the present time than ever, and give unmistakable evidence that the building is still settling.

PLANS WERE filed a short time since in the Bureau of Buildings, this city, for the erection of two costly dwellings at the corner of Madison avenue and Sixty-seventh street. The estimated cost is $110,000 each. The houses are to be erected for Mr. William Skidmore, under the supervision of Mr. Robert H. Robertson, architect. One of the houses is 30 feet front by 72 feet deep, and the other 20 feet front by 72 feet deep. Both are to be four stories high, with basement, and are to be capped with slate roofs. The first story will be constructed of Belleville stone, quarry dressed. The second story, above the main entrance, will be of dressed stone. The upper stories will be of brick with dressed-stone trimmings. The main entrance to the larger house will be near the center of the building. It will be approached by a wide stoop, the stone steps of which are to rise parallel with the sidewalk, with a square platform at the bottom and top. The main doorway, which will be 6 feet in width, will be set in a large stone arch heavily molded. On either side of this massive entrance is to be a similar arch in which large bay windows will be set. The effect of these arches will be to make the front of the building one of the most imposing to be seen on any of the avenues of the city. The entire exterior is to be constructed in a style to match the elegance of the grand entrance. The interior will be elaborately finished in hard wood. Within the vestibule will be a large hall with a massive staircase at the back. This hall will be 16 by 25 feet in size. To the left will be a large parlor, fronting both on Sixty-seventh street and Madison avenue, and lighted by a large bay window opening on to the former. To the right of the hallway will be a reception room facing on Madison avenue; beyond this the dining-room. Back of the dining room will be the butler's pantry. On the second floor are to be a sitting-room, a retiring-room, which is approached by an alcove, and two large bedrooms, with a dressing-room attached to each, all well lighted directly from the street. Bathroom will also be placed on this floor. The upper stories will be divided into bedrooms, trunkrooms and bathrooms.

BUILDING ENTERPRISES in Philadelphia this season have been sadly interfered with, retarded and diminished by the influence of the recent strikes of the bricklayers, hodcarriers and laborers. This is very greatly to be regretted, in view of the number of large and important undertakings that were on hand or projected at the outset of the season. Operative builders cannot, under such circumstances, make satisfactory contracts with capitalists, and therefore, to avoid total loss, a number of undertakings have been abandoned.

FREQUENT INQUIRIES are made concerning portable houses and ready-made houses. We understand that a company has recently commenced work in this line at Quebec. A number of houses, averaging 24 feet square, were first made, for transportation to Panama, for the use of the workmen engaged upon the Isthmus Canal. A more recent contract has been made to construct 1000 houses, to be forwarded to Manitoba, some of which are three stories high and 60 by 85 feet in size.

WE NOTED in a recent number that the Metropolitan Opera House scheme had been indefinitely deferred, on account of the increased cost. Just at the time our paper went to press a meeting was held by the stockholders, which was very largely attended, at which it was resolved to raise the half million dollars necessary to complete the plans as originally devised, and to proceed with the work. Accordingly, it is probable that the enterprise will be carried through, instead of being abandoned or indefinitely deferred, as seemed probable a few weeks since. The large amount of money involved in carrying forward this scheme is a forcible illustration of the changes which have taken place in the market during the past few months.

DURING SIX MONTHS past there have been erected at Niagara Falls over 40 buildings, the most of them being dwellings varying in cost from $1000 upward. A paper mill, with all the modern improvements, has also been built. A wood-pulp mill, 50 x 100 feet, four stories high, and having a capacity of 8 tons of pulp every 24 hours, is also among the improvements. A number of new buildings are contemplated for the present season, among which may be mentioned a bank building, to cost about $30,000.

THE BUILDING CONTRACTORS of St. Louis, profiting by the example long set them by other trades, have formed a Master Builders' Association for mutual conference and protection. The initiation fee is $5, and monthly dues of $1. Among their by-laws are the following:

No member of this association shall give estimates on work unless the party or parties receiving such estimates appoint a day and hour of opening the bids, and bidders notified of the time and place of opening and the bidders shall have the privilege of being present.

No member of this association shall estimate on any work unless he can have the plans and specifications in his possession for not less than twenty-four hours.

No member of this association shall receive proposals from any sub-contractor that gives his proposal to the architects, owners or agents of buildings when said buildings are estimated for as a whole.

No member of this association shall estimate for buildings where the architect, owner or agent is receiving estimates for the building in the aggregate and in detail at the same time.

No member of this association shall contract for building unless each lowest builder in rotation on same shall voluntarily decline to contract for same.

No member of this association shall employ the apprentices of any other member of this association without the consent of his former employer.

THE NEW co-operative apartment house now building at the corner of Fifty-second street and Madison avenue will have several special features. The basement will be almost entirely above the sidewalk; there will be a fire-proof mansard roof, on which a summer garden will be arranged, with a fountain and sprinklers to keep the tiles cool; marble stairways, an appliance for cremating vegetable refuse, and all the rooms are to be heated by air warmed by steam pipes. A novel improvement is to be put into the bedrooms. Instead of slats, the bedsteads are to have bottoms of steam pipes, which will be connected with a steam coil for warming purposes. The building is to cost $350,000, and will be ready for occupation in October next.

THE NEW county court house at Hartford, Conn., is to be built to plans prepared by Mr. John C. Mead. This architect has built some of the finest edifices in Hartford, including the private residence of Cornelius Vanderbilt. The court house will have a frontage of 80 feet on Trumbull street, and 141 feet on Allen street. The cost of the building is estimated at $175,000, exclusive of the land.

AT OGDEN CITY, Utah, a Mormon Church, costing $75,000, is to be built this season. A building to be used for town meetings, costing $15,000, is to be erected in the same place. A $75,000 hotel is also being built in Ogden for Mr. John Broom. Mr. A. J. Pershaw is the contractor of the latter.

Mr. E. B. GREGORY, architect, of Elmira, N. Y., has prepared the plans for a residence for the Hon. H. W. Williams, to be erected at Wellsboro, Pa. The front will be of pressed brick, with cut-stone trimmings. The cost is estimated at $12,000. The same architect has prepared plans for a schoolhouse to be erected at Corning, N. Y., to cost about $12,000; a schoolhouse at Pine Valley, N. Y., to cost $2500; a residence for Mr. S. M. Friendly, at Elmira, to cost $8000. We also learn that he is engaged upon a number of store buildings and business blocks, and that the building outlook in Elmira and vicinity at the present time is excellent.

THE MANUAL TRAINING SCHOOL connected with Washington University, St. Louis, has been so successful that an additional building has become necessary, and a contract has already been made for its erection. It will be three stories high, besides basement to front 55 feet on Washington avenue, and will cost about $20,000. Mr. Frank S. Greene is the builder. It is to be done by the 15th of next September. This will increase the capacity of this school to 300 pupils.

A NEW opera house is being built at Hannibal, Mo., to cost $35,000. We also learn that what is called a "Temperance Tabernacle" will soon be finished.

THE PHILADELPHIA *North American* notes with pleasure an increasing tendency to make use of enameled bricks for house fronts in the streets of that city, and says that it will be still more pleased if the progress of the innovation is made more general and rapid. The cost of fronts of this kind is not excessive, considering it in proportion with the total cost of the building. It is not as great, in all probability, as that of marble, which is commonly used in that city, while we think it is much more attractive for the purpose.

MR. PARKE GODWIN is to put up a seven-story office building on the corner of Nassau and Liberty streets, this city, at a cost of $200,000. It is to be called the "Bryant Building."

A HUMORIST says that conjurors astonish an audience by taking rolls of ribbon from their mouths. It is a common thing, however, to see a carpenter take a hammer and nails out of his chest.

THE GRAND TRUNK RAILROAD is to build a new depot at Mechanics Falls, Maine, during the coming season.

A COURT HOUSE, costing $50,000, is to be built at Marshall, Saline County, Missouri, during this season. The designs have been prepared by Mr. Cochrane, of Indianapolis.

AT NORWAY, ME., a town hall, costing $1500, is to be erected this season.

CARPENTRY AND BUILDING

A MONTHLY JOURNAL.

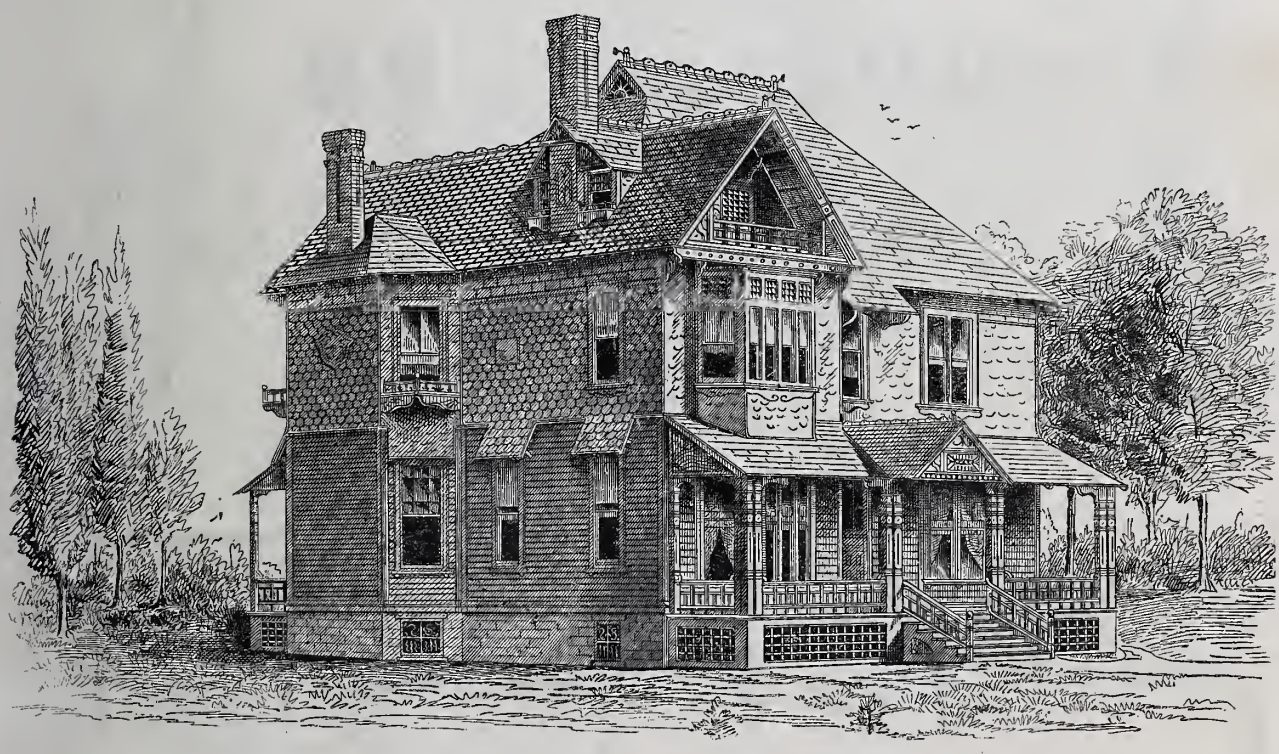
VOLUME IV. NEW YORK—JULY, 1882. NUMBER 7

Result of the Sixth Competition.

In our sixth competition, which closed May 31, a very creditable number of entries was made, and some very fine drawings were submitted. The result of the committee's deliberation was to award the first prize, $100, to Mr. Edward S. Hammatt, Albany, N. Y.; the second prize, $60, to Mr. B. C. Pond, Auburndale, Mass., and the third prize to Mr. Theodore A. Richter, Jr., Cincinnati, Ohio. In this contest, as in others which have been conducted by this journal, the committee found itself obliged to throw out several sets of drawings which in all respects, save one or two conspicuous errors, were candidates for positions of honor. In this instance two of the finest sets which were submitted, and both of which, so far as has been ascertained from the committee, were considered by them even superior to some of those to which the prizes were awarded, were deficient in the matter of the side entrance to cellar and kitchen, which, by an examination of the floor plan, our readers will see should show upon both front and rear elevations. It seems strange to us that architects should make errors of this kind; that they are habitually doing so is notorious. In a somewhat extended experience with architects' drawings, both in connection with this paper and in a long, practical experience in building, we have seldom met a set of drawings which was correct in all particulars, or the several views in which were consistent with each other. This is a shame and a reproach to the profession. While in some instances it deprives the authors of plans of the reward to which they aspire, as, for example, in this case, in many instances it results in expense to the builders who follow their plans, or in expense to their clients for whom the houses are being built.

The drawings receiving the first prize, and which, in the estimation of the committee of award, were the best of all the sets submitted, have been carefully engraved and are presented herewith. Briefly referring to some of the features of this design, as mentioned in a note from their author, which accompanied them, we may call attention to the following: In the elevations, while the treatment is quiet, the lines are so arranged as to produce a rich effect with small expense. The construction has been ornamented only in such parts as seemed to require decorative treatment. On the front elevation a very pretty feature is obtained by putting a gable over the octagonal bay and making a recess in it, thus forming a balcony opening out from the billiard-room. The dormer windows are placed so as not only to add to the pleasing effect of the exterior, but where at the same time they will give the best lighting effect to the interior. Concerning the use of the extra rooms provided in the attic, the author says that while it seems best to employ them as they are named in the attic plan, they can be equally well used for sleeping-rooms. His design has been to place ventilating windows or louver boards behind the ornaments in the small gables in the roof, thus securing thorough ventilation for the upper part of the house. The little balconies under the second-story windows of bay on the south front have been designed with a view to filling them with flowering plants. This would contribute materially to the general effect of the building. The water table has been so constructed, as shown in Fig. 13 of the details, that the cellar-window head can come up to the under side of sill, thus securing greater hight for the window than is shown in the elevation. A detail of construction that may be properly mentioned in this connection without in any way hampering those who are to write specifications for this building, is the panel in closet doors shown in Fig. 28 of the details. Slats are inserted to secure ventilation to the closet, and thus prevent its becoming musty when not in constant use. It has been the author's design to place double slats or louvers in the door panels turned in the opposite direction. This construction will prevent spoken words being distinguished on opposite sides of a door, so that this feature might be extended with advantage to other doors besides those of closets.

In this connection it is proper to remark that in the estimation of the committee of award the introduction of a gable in the roof of the front porch was not a violation of the terms of the competition. From the fact that a majority of the drawings submitted introduced this feature, it would seem that the general opinion of the competitors was that such a privilege should be allowed in working out the elevations. We think ourselves that the plan of roof shown in connection with the second-floor of the original drawings, was not an essential feature of the plan of the house, and that the designers were right in disregarding the strict letter of the specification in this respect. We allude to this matter in explanation of the evident discrepancy between the elevations and the second-floor plan presented in Fig. 7. This item the writers of the specification can take into account in the same way that discrepancies between different views should be handled in actual practice in cases where it is not deemed necessary to correct by making a new drawing.



Perspective View of the Design Receiving the First Prize in the Sixth Competition.—Edward S. Hammatt, Architect, Albany, N. Y.

First Prize Design in the Competition in Elevations and Details of the Eight Room House.—Fig. 2.—Front Elevation.—Scale, ⅛ Inch to the Foot.

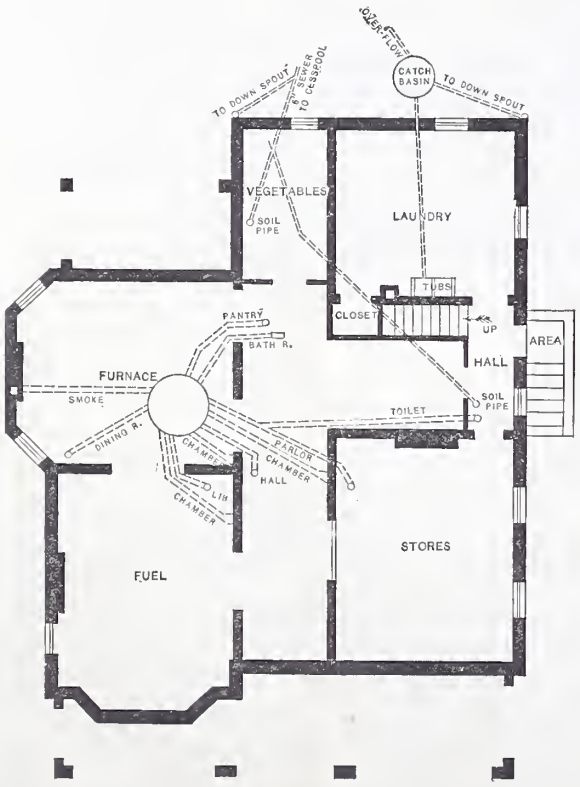


Fig. 3.—Foundation and Cellar Plan.—Scale, 1-16 Inch to the Foot.

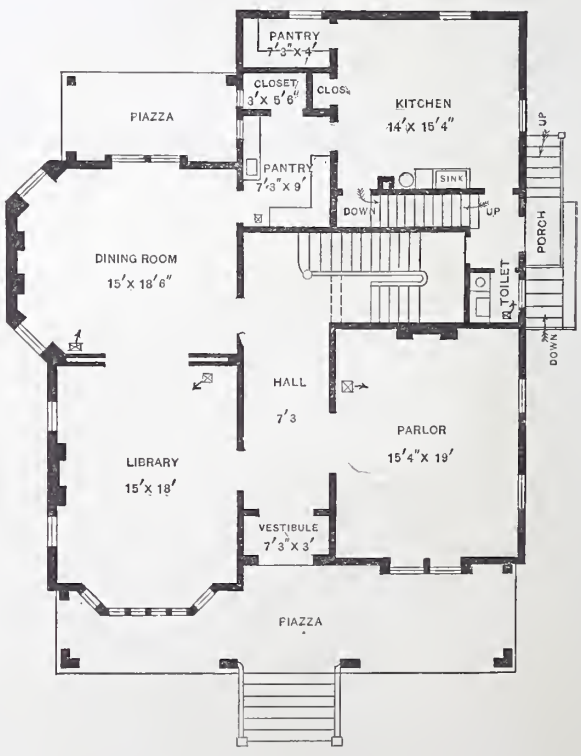


Fig. 4.—First Floor Plan.—Scale, 1-16 Inch to the Foot

First Prize Design in the Competition in Elevations and Details of the Eight Room House.—Fig. 5.—South Side Elevation.—Scale, ⅛ Inch to the Foot.

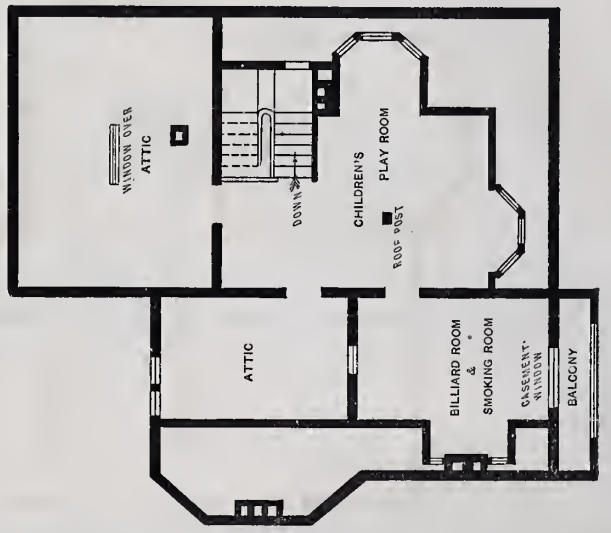


Fig. 6.—Attic Plan.—Scale, 1-16 Inch to the Foot.

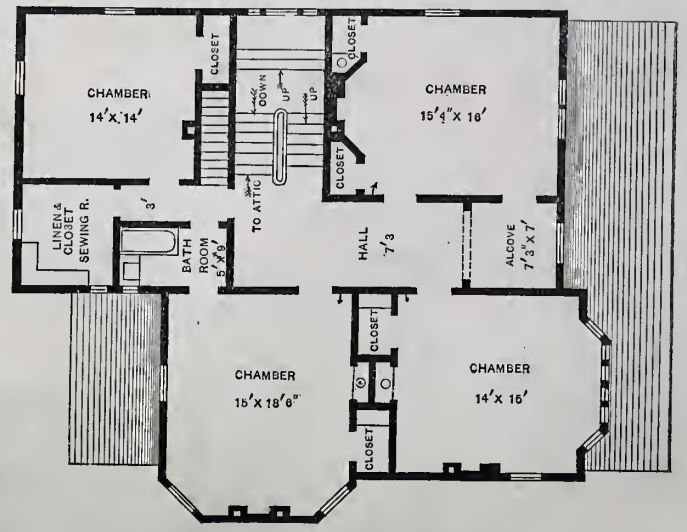


Fig. 7.—Second Floor Plan.—Scale, 1-16 Inch to the Foot.

The Seventh Competition.

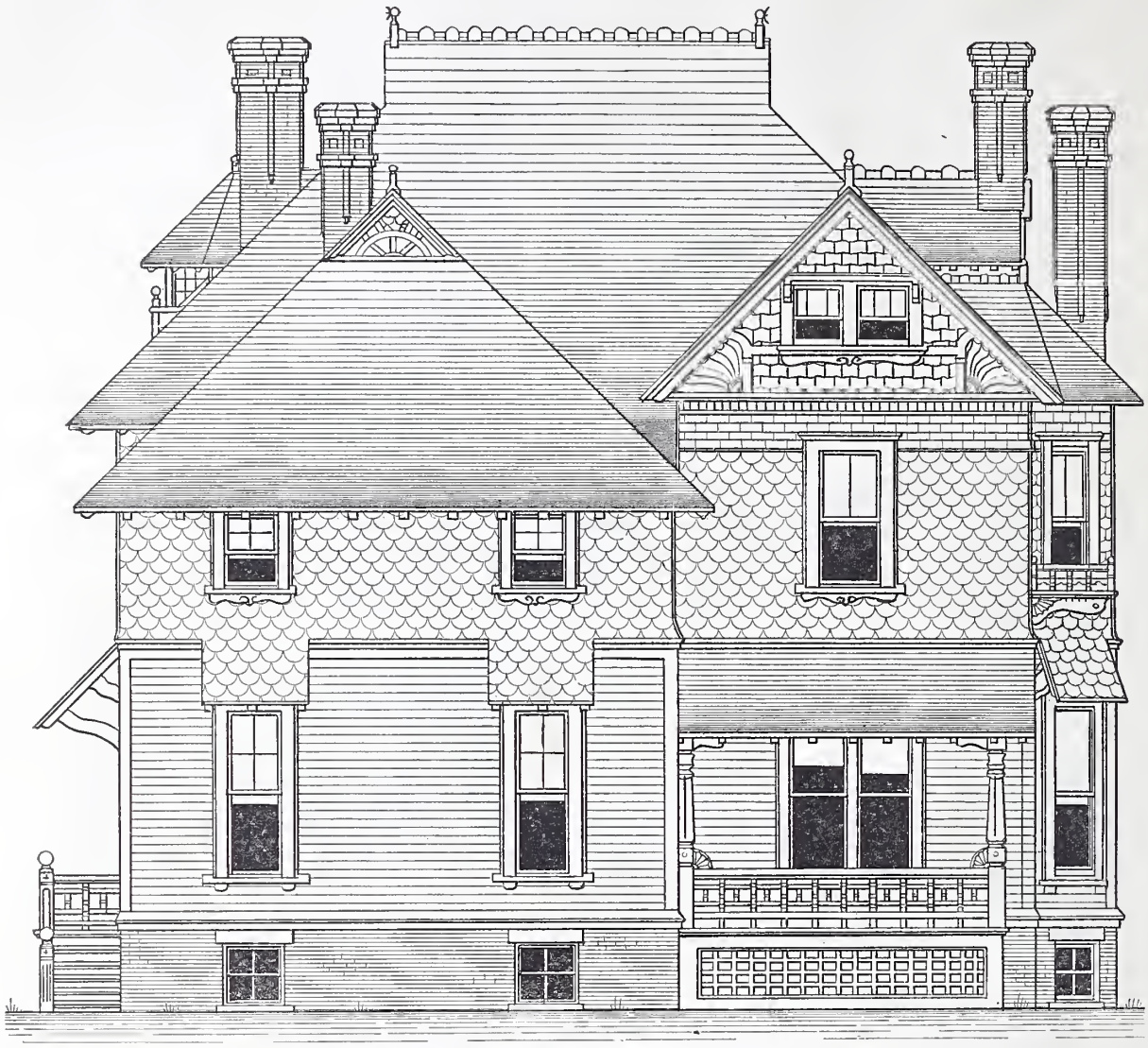
GENERAL CONDITIONS.

The elevations, floor plans and details of the eight-room frame house which appears in this issue, form the basis of our seventh competition, the subject of which is the specifications for material, workmanship and construction of the house in question. By the conditions of the first competition of this series, published on page iii of the advertisements in our December issue, the lot on which the house is to stand is 75 feet front by 250 feet deep. It is located in a village or suburban district. The front of the lot is toward the east and the side toward the south. Little or no grading is required. The drainage is to be provided on the premises, as no public sewer is accessible. The water supply is also a private affair and is to be arranged independently of any public water works.

No further conditions or description have been published in this connection than are deemed absolutely necessary to the conduct of the competitions which have taken place, and we shall add at this time only that which seems absolutely necessary to put the specifications upon a common basis, in order to facilitate comparison and in order to give all competitors a like opportunity for success. Recognizing the difference in building materials as between different sections of the country, and well knowing that a builder or architect who is accustomed to specifying in one locality will be, to a certain extent, at a disadvantage when called upon to specify in another locality, we shall describe, in the most general terms, the materials which are supposed to be available in the locality in which this house is to be built. Competitors in this contest are requested to confine themselves in their specification to terms indicating general quality, rather than to terms which only have a local significance.

The character of the ground on which this house is to be built may be considered the average to be found in eligible building sites. It is not expected that stones requiring the blast for removing, or sand requiring special provisions in foundations, will be encountered. At the same time the ordinary liability to encounter difficulties of this kind must be taken into consideration. The materials available in the neighborhood for the foundation are a good quality of quarry stone which is marketed of convenient size for purposes of this kind. Some little dressing may be necessary. Good hard-burned brick are also to be had. A good quality of lime and a fair article of sharp river sand is available.

The timber used in the vicinity where this



First Prize Design in the Competition in Elevations and Details of the Eight Room House.—Fig. 8.—Rear Elevation.—Scale, ⅛ Inch to the Foot.

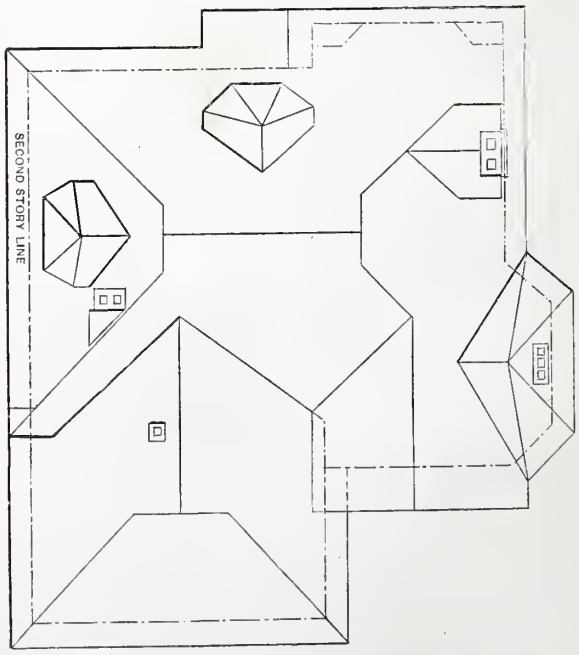


Fig. 9.—Roof Plan.—Scale, 1-16 Inch to the Foot.

house is to be built is pine and hemlock. Almost any grade and size of each of these two materials may be obtained. Various native finishing woods are also available, among which may be mentioned walnut, ash, cherry, butternut and chestnut. For chimneys good ordinary brick are available. It is also possible at no unreasonable expense to obtain pressed brick and bricks of various shapes and colors.

With reference to the building laws of the community in which this house is to be erected, it will be assumed that it is in a neighborhood in which there are no special restrictions. It may be assumed that the builder will not be permitted to occupy an unreasonable amount of space in either of the two streets upon which the lot fronts, and that he will be obliged to keep the sidewalks open to passage at all times during the progress of the building. The time at which this building is to be commenced we will assume to be the first of September, 1882. The time of its completion is left to the discretion of the competitors in this contest, with the simple remark that it is the supposed desire of the owner that it be done with all possible dispatch, having due reference to the quality of the work.

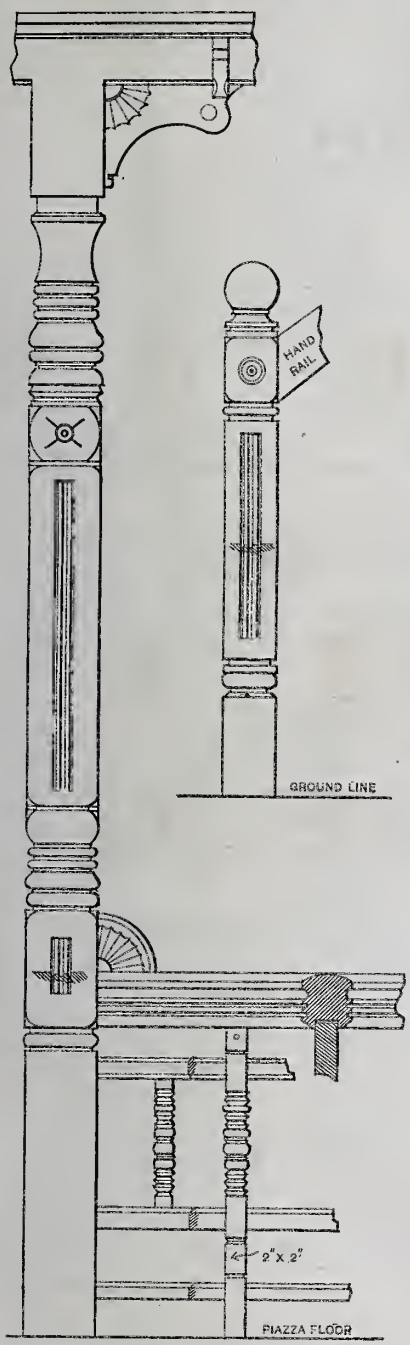


Fig. 10.—Details of Piazza.—Scale, ½ Inch to the Foot.

REQUIREMENTS.

What is required in this contest is a specification of materials, construction and workmanship on the house shown in the accompanying elevations and details. In this contest, as in the previous ones of this series, no limitation of cost is made, but it is expected that due reference to the proprieties of the case will be observed. It is desired that the house shall be specified in a thorough manner, and in a way to make its construction and finish appropriate to the design. In deciding this contest the thoroughness and completeness of the specification will be considered, the appropriateness for the house to which it applies, the general arrangement of the specification, as adapting it to use by the several trades that would be engaged in the erection of the house, and its general style. By the latter we do not mean that its literary excellence will form a prominent feature in its consideration, but its practical usefulness in all the points named. Since this specification, in connection with the set of drawings presented herewith, is to form the basis of the final competition of the series, namely, a detailed estimate of cost, the necessity for thoroughness and accuracy in its preparation will be appreciated by the competitors. It is not expected that it will be necessary to furnish competitors in the final contest any other information than is afforded by the drawings and the model specification which we hope to obtain in this contest, save only a price list of building materials. Items in this price list, of course, will be determined by the specification. We merely refer to these points because they are likely to throw some light upon the actual requirements in this case.

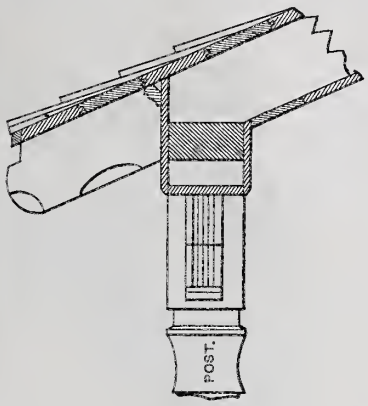
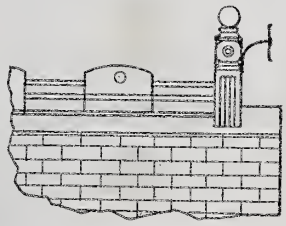


Fig. 11.—Piazza Ceiling and Rafter.—Scale, ½ Inch to the Foot.



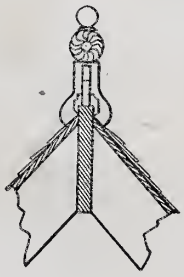


Fig. 12.—Detail of Cresting and Finial.—Scale, ½ Inch to the Foot.

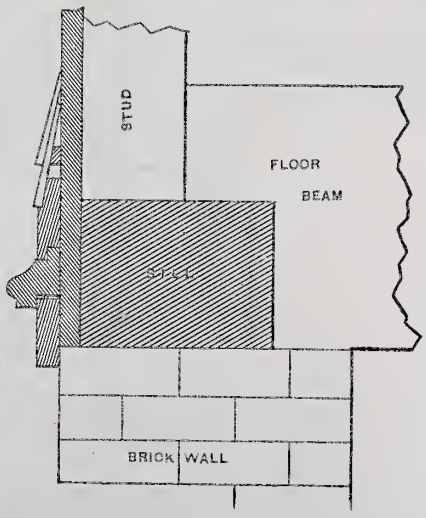


Fig. 13.—Section Showing Construction of Water Table.—Scale, 1½ Inch to the Foot.

Legal cap paper is to be preferred in all cases, as the material upon which the specifications are to be written. Only one side of the paper is to be written upon. The introduction of sub-heads or marginal notes for reference is left entirely to the discretion of the competitors, with the remark that the matter of convenient reference to the specification is a feature deserving of the most careful attention upon the part of contestants.

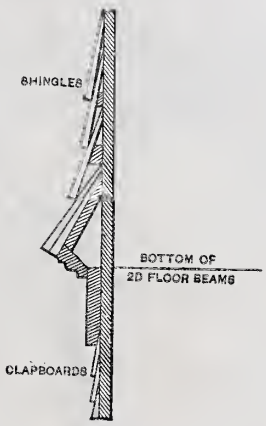


Fig. 14.—Second Story String Course.—Scale, ½ Inch to the Foot.

Each specification must be signed by a ficticious name or device. The same name or device is to be put upon a sealed envelope, which shall contain the real name and address of the competitor. This envelope is to be inclosed with the specification.

PRIZES.

The prizes to be awarded in this, our seventh competition, are as follows:

First Prize.....$50.00
Second Prize..... 30.00
Third Prize..... 20.00

It is supposed that these amounts are sufficiently liberal to call out a very large response from architects, builders and amateurs.

TIME.

Specifications submitted in this contest must reach this office not later than August 31. The manuscripts may be sent by mail or express (charges prepaid), and in either case must be adequately protected for carriage. They are to be addressed to David Williams, 83 Reade street, New York City.

DECISION.

All the specifications received up to the date above named, will be put into the hands of a competent committee, with whom will be left the manner of deciding this contest. Should it be deemed feasible, after seeing the length of the specifications, it may be determined to publish a number of the best and invite a vote from our readers in a manner similar to that pursued in our fifth competition. Until it is known, however, what amount of space will be required for this purpose, we cannot say definitely that this will

of the plainness of the vast number of ordinary dwelling-houses which compose this mighty wilderness of homes. In Paris, Madrid, New York, Boston and Chicago, the homes of the population are generally as uniform as those of Philadelphia, and in the nature of things this is unavoidable, because of the immense number of dwellings; but what seems to us to be a fatal oversight in Philadelphia is the failure to improve, in a truly metropolitan style, such streets as Market, Broad, Spring Garden, Washington avenue, Girard avenue, &c. We refer now to the widest and noblest thoroughfares in the city. Market street, from the river Schuylkill to the new City Hall, is in a worse condition of neglect than Broad street, from Cherry to Ridge avenue. And yet the city has done its full share toward the improvement of both streets by paving them sub-

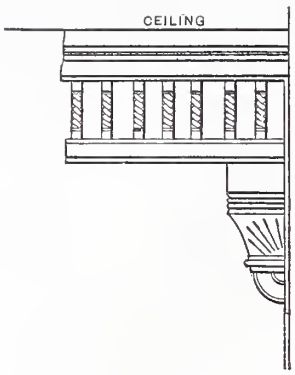


Fig. 25.—Arch Over Stairs in the First Story Hall.—Scale, ½ Inch to the Foot.

stantially with Belgian blocks of stone at the expense of the city, while the private property owners, instead of appreciating the advantages of the situation, neglect even to put their footways in repair, and appear to be generally waiting for a rise in the value of real estate to enable them to sell out to advantage. The case is rather better on North Broad street above Ridge avenue, but even there the buildings do not come up to the hotels, restaurants, shops, stores, and all other buildings upon which metropolitan architecture finds a large and proper development. The occupation of half a square for a private garden attached to a two or three-storied dwelling, would be appropriate an adequate amount of taxes into the public treasury.

The marvelous durability of mortar in Italy is attributed by the London *Builder* to the fact that the lime remains in the pit, cov-

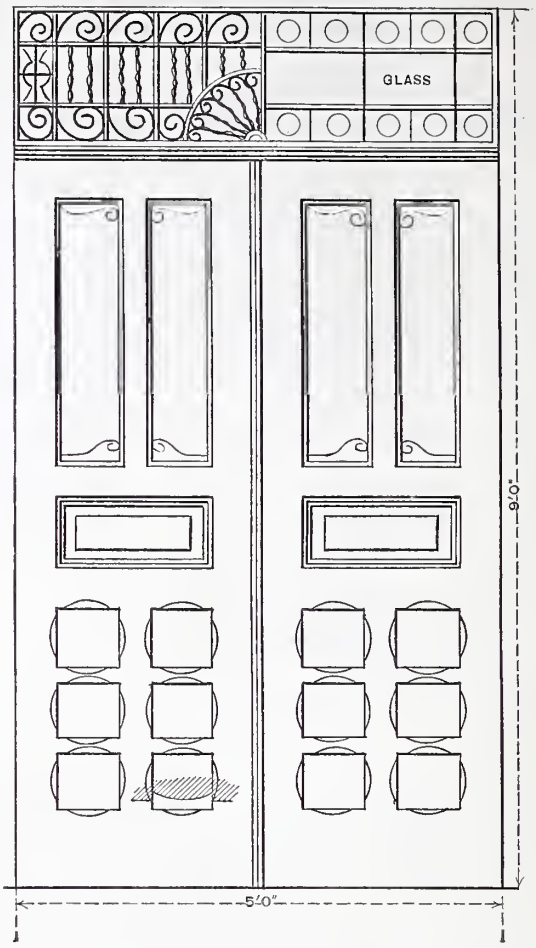


Fig. 27.—Outside Doors of Principal Entrance.—Scale, ½ Inch to the Foot.—The Grille is Removed From One-half of the Transom In Order To Show Glass at Back of It.

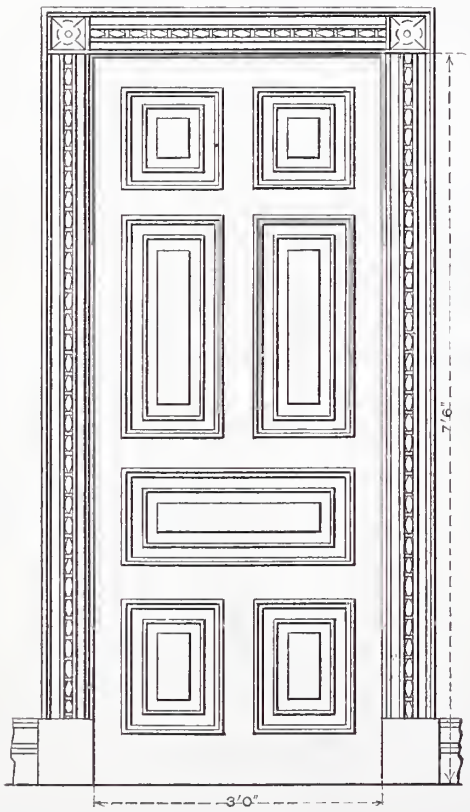


Fig. 26.—Detail of Doors in the First Story.—Scale, ½ Inch to the Foot.

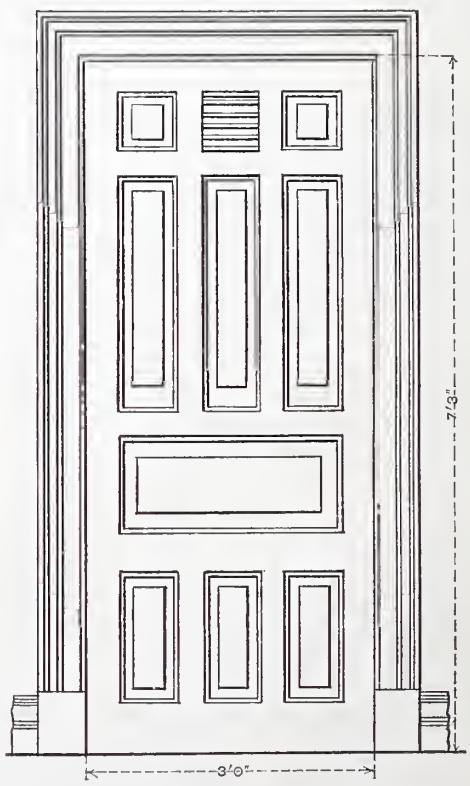


Fig. 28.—Second Story Door.—Scale, ½ Inch to the Foot.

high standard of architectural taste we have referred to above. The misfortune of the class of improvements consisting of churches and dwelling-houses is that they involve the discouragement, restriction and exclusion of enough in a remote suburb or rural environ, but is wholly inappropriate on a grand main avenue in the heart of a metropolitan city, besides being undesirable on account of the important fact that such property never pays ered with water, for two years before it is used, whereas in England and America lime is slaked and used almost the same day. It is not uncommon for business corporations to require new slaked lime.

NOTES AND COMMENTS.

The next best thing to making a school-house fire-proof, or providing one that is not fire-proof with every possible means of escape in case of a fire, is that of drilling the pupils to leave the building quickly and in good order in case of an alarm. At the

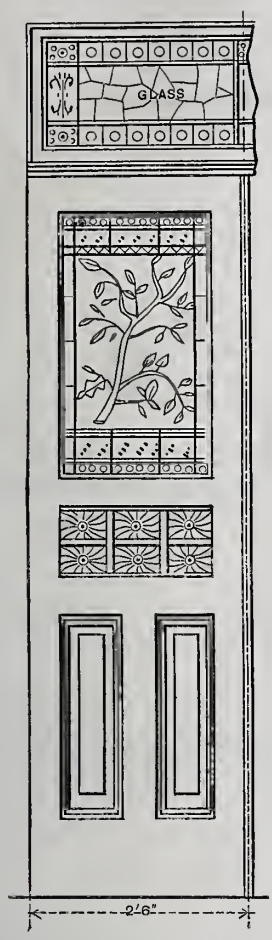


Fig. 29.—One-Half of Inner Front Vestibule Doors.—Scale, ½ Inch to the Foot.

Newton Grammar School, Philadelphia, which contains 650 children, the pupils have been thoroughly drilled in matters of this kind. Speaking trumpets have been connected with the different floors, and in the event of fire the alarm is immediately given throughout the building. The trial is repeated three times a week. A short time since a trial of emptying the building was made, the scholars not being informed that it was not really a fire. The alarm was sounded, and the scholars quickly took their position in line, the whole number reaching the school yard in a minute and three-quarters. This remarkably short time must be a guarantee to the parents and friends of the children that their lives are in as little danger from a conflagration as is possible under the circumstances. The example of the teachers and superintendent of this school could well be emulated in various directions throughout the country.

Much has appeared in the daily papers the last few weeks with regard to the check to the prosperity of cities, and the country generally, brought about by untimely strikes, which have paralyzed manufacturing industries, and left many flourishing and influen-

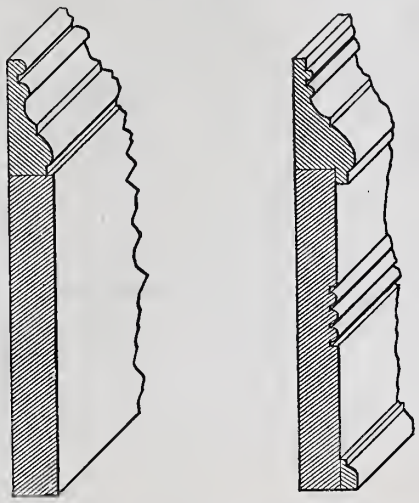


Fig. 31.—Base Board in First (at the Right), and Second (at the Left) Stories.—Scale, 3 Inches to the Foot.

tial interests at a standstill. Building interests have suffered fully as much from this unsettled condition of affairs as any other. At the commencement of the season there was every prospect of such an active building season as had not been witnessed in many years. New buildings were projected everywhere. Architects had drawn plans for unprecedentedly large amounts of work. The improvement in rents and the low rate of interest on capital prevailing tended to encourage the investment of money in this way, but the unsettled prices in labor, and the threatening attitude of labor unions, have had the effect of changing this state of things in almost every section of the country. In some places it is not nearly so apparent as in others, and in some localities where there is apparently quite as much prosperity as was anticipated, the exception to the rule does not prevail. Real estate owners and operators are going forward simply because the change in the condition of affairs occurred too late to permit them to stop advantageously, but in these very communities there is an absence of still newer enterprises being put on foot. It is to be hoped that the labor difficulties which have assumed such formidable shape will be early adjusted, so that the latter part of the season may be quite as prosperous as the opening promised.

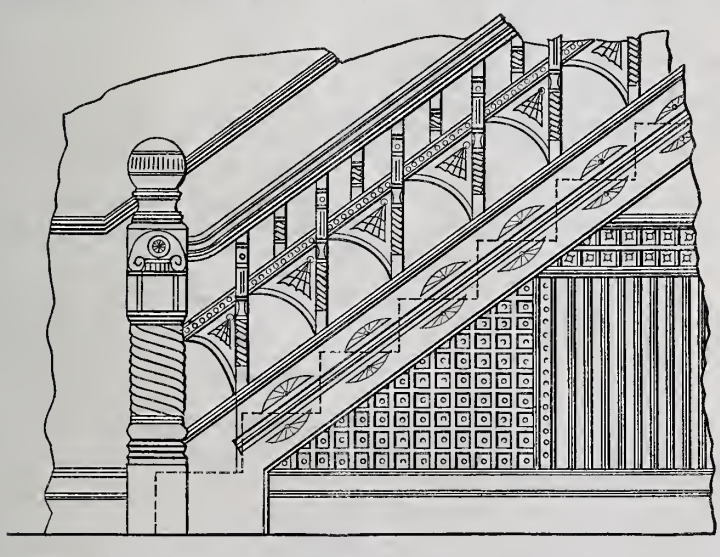


Fig. 30.—Elevation of Main Stairs and Wainscoting in Vestibule.—Scale, ½ Inch to the Foot.

Eddystone lighthouse, which for so many years has been the theme of poets and travelers and a practical guide to the shipping entering the British channel, has been for a long time in a very dangerous condition. While the tower itself was sound and perfect as ever, the rock upon which it stood was so completely undermined by the terrific pounding of the sea, and so strained by the leverage of the tall shaft above it, that it gave way to such an extent as to make the lighthouse itself exceedingly insecure. The new lighthouse which takes its place has just been completed. The first stone was laid in August, 1879. In some respects the work has been more difficult than the original, for

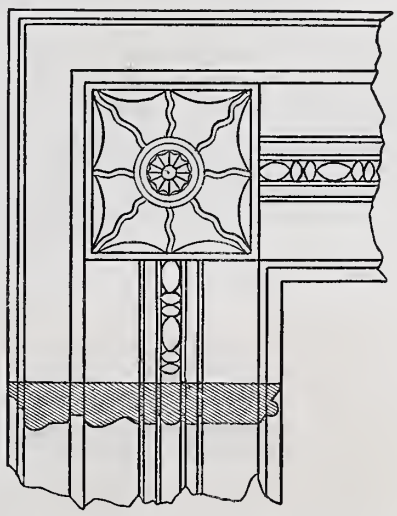


Fig. 32.—Upper Corner of First Story Architrave.—Scale, 3 Inches to the Foot.

it must be remembered that the original lighthouse was built upon the best site which could be found, and that in erecting the second, the next best place had to be selected. Modern machinery has made the work, however, comparatively easy, and there have been no delays on account of calms or from the want of sufficient power to handle the blocks of stone quickly. Smeaton had to do his work with only manual labor to assist him, and with sailing vessels to carry the stone, and it is a wonderful record that he was able to accomplish the building at all, and still more wonderful that it should stand until the rock itself gave way beneath it. The old structure, which is only 72 feet high, is to be removed and rebuilt at Plymouth. The new structure is 130 feet above high-water mark.

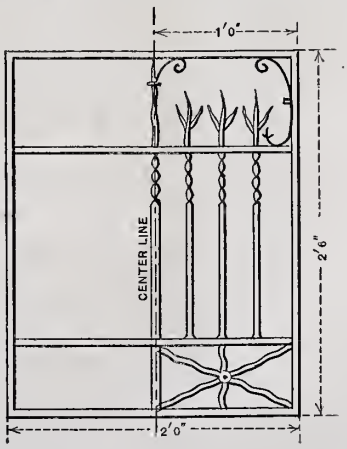


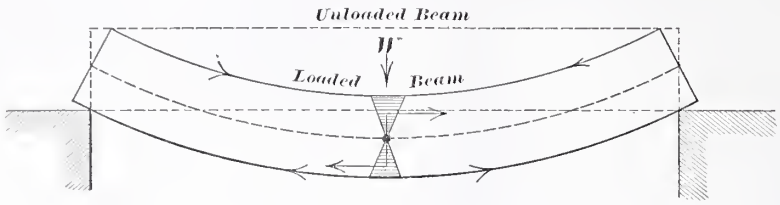
Fig. 33.—Wrought Iron Guards for Cellar Windows.—Scale, ¾ Inch to the Foot.

To find the diameter of a circle.—Run a tape-line across it.

Calculating Strains.

(Continued from page 110.)

The beam A B, Fig. 7, (see last issue) being thus held in equilibrium under the action of the vertical forces—the weights acting downward and the two supporting forces acting upward—there must be no tendency to rotate, and therefore if we assume any point for an axis, or suppose the beam divided by an imaginary vertical D into two sections, the sum of the moments, that is, the products of each force by its distance from this plane, must be equal



Calculating Strains.—Fig. 9.—Effects of a Load Upon a Beam.

to zero—calling one set of moments positive or plus, and the other set negative or minus. The sum of these moments on one side or the other, is called the "bending moment." To find now the bending moment at D, we proceed as follows: First we find the abutment reaction in the manner before stated, and multiply this by its leverage or lever-arm from D, and then, of course, subtract the

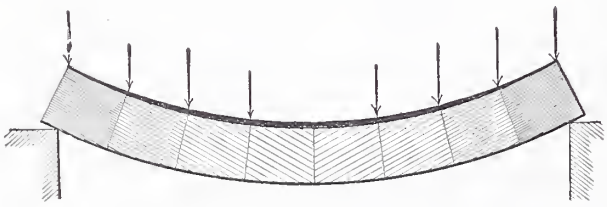


Fig. 10.—Showing Shearing Stress Greatest at the Abutment.—The Gradations in the Shading Lines are Intended to Indicate the Degree of Stress.

sum of the moments of the forces which lie between D and the abutment and have, therefore, a tendency to turn the beam in the opposite direction. We found the abutment reaction at A = 14.28; the bending moment at D with reference to A will therefore be

$$(14.28 \times 15) - 11 \times 6 - 7 \times 6 - 5 \times 3 = 214.20 - 123 = 91.20 \quad (4)$$

or with reference to B we have

$$12.72 \times 10 - 3 \times 12 = 127.2 - 36 = 91.20 \quad (5)$$

and calling one of these moments positive and the other negative, their sum

$$+91.20 - 91.20 = 0, \text{ as before stated.} \quad (6)$$

By the composition of forces we are enabled to substitute for the effects produced by

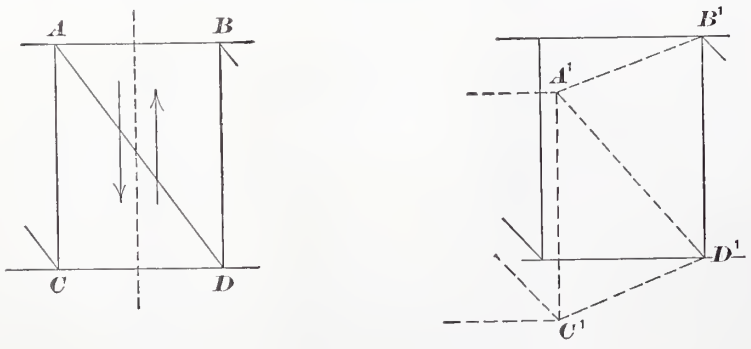


Fig. 11.—The Shear Effect in a Truss Panel.

the partial loads w_1, w_2, . . . etc., on one side of D, a single equivalent force—their resultant—and in the same way the resultant of the forces acting upon the other section of the beam, and since the beam is in equilibrium, these forces, as has been shown, must be equal in intensity and opposite in direction. But as these forces tend to move the beam or truss in opposite directions, there must be a resisting stress in the fibers of the beam, or in the braces of the truss, to prevent movement. If movement took place it would be similar to that resulting by shearing off one section of the beam from the other—and the resultant of the vertical forces on one side of the section is, therefore, from the nature of the movement, called the "shear" or "shearing strain," and the resisting force in the material the "shearing stress;" the "shear" is positive on one side of the section and negative on the other side.

It is a well-known law of mechanics that a force acting at any distance from a given point is equivalent, as far as its action in regard to that point is concerned, to the same force at the point and a moment equal to the product of the force by its perpendicular distance from the point. Since the external forces are vertical, their only effects at any section D then, must be those due to a vertical force, namely, the "shear" and the bending moment, or, in other words, the loads upon a beam or truss produce an effect which is represented by equivalent vertical and horizontal components. As the horizontal components become greater, the vertical components must, of course, become less, hence where the "bending moment" is greatest, the "shear" is least, and *vice versa*. The shear is greatest, therefore, at the abutment—where the bending moment is zero—and least at the middle or center of the truss where the bending moment becomes a maximum.

This will become plain from an inspection of Figs. 9 and 10, which represent in an exaggerated way, the effects of a load, W, upon a beam. The bending of the beam by the imposition of a load is accompanied by a pulling stress in the fibers furthest from the load, and a thrusting stress in those nearest the load, that is, the lower side of a beam or lower chord in a truss will be under tension, and the upper side of the beam or upper chord of a truss under compression. The extreme stresses in the fibers of a beam are represented in Fig. 9 by the two shaded triangles, showing them greatest at the outside fibers and least at the center line of the beam, which is therefore called the "neutral axis." If the shaded areas of the triangles represent the sum of the stresses, the distance from each other of their centers of gravity will represent the leverage or lever-arm of their resultants, and this is called the "effective depth" of the beam or "hight of truss" when we refer to distance between centers of chords. The resultants of tension and compression thus form a "couple," and since they are equal in amount and opposite in direction, it follows that the tension is equal to the compression in the same section of a beam or in those parts of the upper and lower chords which lie between parallel ties or braces.

The shaded lines in Fig. 10 show how the shearing strain decreases from the abutments toward the center, while tension and compression increase and become greatest at the center.

A reference to the panel A B C D, Fig. 11, will show how the direction of the shear determines the kind of stress in the diagonal members of a truss, sometimes called web-members. This direction is indicated by the arrows in A B C D. If we imagine the chords severed, or merely jointed, as is the case in pin-connected bridges, it becomes clear that if no diagonals were in the panel it would be distorted by the load to the shape A' B' C' D.

Fig. 12.—Beam Fixed at one End and Loaded at the Other.

The chords alone, therefore, cannot resist the shear or transmit a vertical force, and hence diagonals must be introduced into the panels, which are called "struts" or "braces," when they have to resist shortening, *i. e.*, compression; and "ties" when they have to resist lengthening, *i. e.*, tension. The web-members of a truss, or the webs of beams, therefore resist only the "shear," or the vertical effects of the load and the chords, or flanges, the horizontal ones. The horizontal strains in the chords of a truss are therefore similarly determined as those in a beam, by ascertaining the bending moments for different conditions of loading.

Designating now the maximum moment by M*x*, the length of the beam by *l*, the partial loads by *w*, and the total load by W, we have:

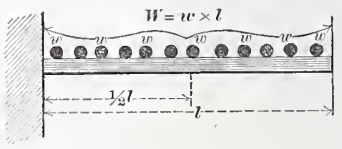


Fig. 13.—Beam Fixed at One End, Loaded Uniformly.

1. For a beam, Fig. 12, loaded at one end, and fixed at the other, since *l* is the lever arm M*x* = W*l*.

2. For a beam, Fig. 13, fixed at one end, and loaded uniformly for each unit of a length with a weight *w*, the total load W will be *wl*. The center of gravity of W will be distant from the support $\frac{l}{2}$, or in the middle of the beam, hence the lever-arm $\frac{l}{2}$ and the maximum bending moment

$$Mx = wl \times \frac{l}{2} \text{ or } Mx = \frac{Wl}{2}.$$

3. For a beam supported at both ends and loaded in the center with W, Fig. 14, the abutment reaction at either abutment will be ½W, and the leverage ½*l*; therefore

$$Mx = \tfrac{1}{2}W \times \tfrac{1}{2}l \text{ or } Mx = \frac{Wl}{4}.$$

4. For a beam supported at both ends, Fig 15, and loaded uniformly for each unit of its length with *w*, so that *wl* = W, the maximum moment will be at the center of gravity of the load, or distant ½*l* from either abutment, and the abutment reaction ½W. But the reaction being upward, we must subtrac

the sum of the moments of any weights acting downward between the abutment and the point in the middle of the beam, as we did before, and as the half beam is loaded with $\frac{W}{2}$, its center of gravity will have a leverage of $\frac{l}{4}$, hence

$$Mx = \tfrac{1}{2}W \times \tfrac{1}{2}l \text{ less } \tfrac{1}{2}W \times \tfrac{1}{4}l \text{ or } \frac{Wl}{4} - \frac{Wl}{8} = \frac{Wl}{8}.$$

We shall proceed now to apply the foregoing principles to the graphical analysis of structures. In the first place, referring back

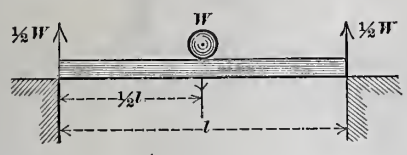


Fig. 14.—Beam Supported at Both Ends, Loaded at Center.

to Fig. 1 (see number 42), let us now suppose the cord fixed at the points A and B and in equilibrium, and the weights w_1, w_2, w_3, w_4, suspended from the points C, D, E, F, respectively, as shown in Fig. 16. From Fig. 4 we know that the tension at C is balanced by the tensions in A C and C D; we can therefore draw a triangle of forces for the point C. If we next take w_2 and the tension of C D just found, we shall obtain a triangle of forces for D, and so forth. But since, when

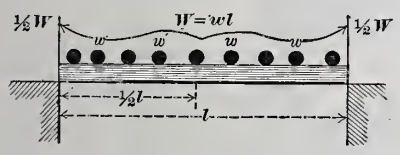


Fig. 15.—Beam Supported at Both Ends, Loaded Uniformly.

we draw a triangle from each loaded point, each portion of the cord will be represented by a side in two of the triangles, and since all of the triangles will have one vertical side, they may be brought together into one figure by the following construction: Draw a vertical line, $a\ b$, and on it lay off $w^1 = a\ c$ $w_2 = c\ d$, $w_3 = d\ e$, and $w_4 = e\ b$. Then draw a o parallel to A C and b o parallel to B F; connect the points c, d and e with o, and the lines a o, c o, d o, e o and b o will be the

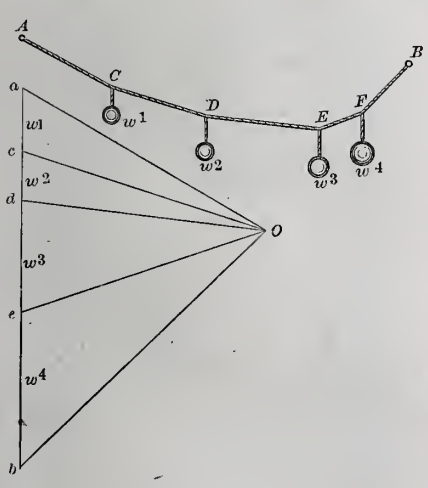


Fig. 16.—Stress Diagram and Moment Polygon.

measures of the strains or tensions in A C, C D, D E, E F and F B.

The figure $a\ b$ o is called the stress diagram; the line $a\ b$ is called the load line, and the polygon which the chord A B forms when in equilibrium under the loads, is called the moment polygon. The point o is called the pole of the stress diagram.

If the weights, their horizontal distances from the point A, and the horizontal distance of B from A alone were given, we might draw a moment polygon to satisfy these conditions by assuming the pole o in any convenient position, drawing the radiating lines to the several points on $a\ b$, then drawing a line parallel to a o from A to meet the vertical through w; from the point C thus found draw a line parallel to d o to meet the vertical through w_2 and so on, the last line parallel to b o determining the position of B, since its horizontal distance from A was previously given. This simple application of the method for finding a moment polygon suffices for the investigation of trusses which is to follow:

Suppose that the roof, Fig. 17, has a certain load over each rafter, let the whole weight be denoted by W, then one-half of the load on the rafter A C will be supported by the joint at A and one-half by the joint at C. The same will be true of the rafter B C, therefore the joints at A and B will each carry ¼ W, and the joint at C will carry ½ W. The additional stress produced on the rafters by the bending action of the load which it carries is not considered now, but must be considered and allowed for separately. Draw the vertical load line $a\ b$ and lay off on it $b\ e = \frac{1}{4}$ W, $e\ f = \frac{1}{2}$ W, and $f\ a = \frac{1}{4}$ W to represent the downward acting weights.

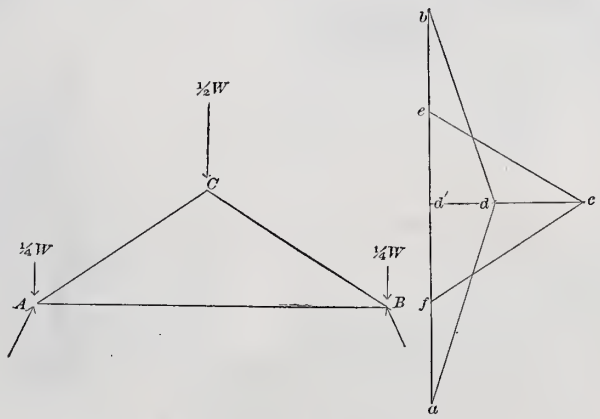


Fig. 17.—Stress Diagram For Roof Truss, A B C.

Let the two reacting or supporting forces for the present be considered inclined from the vertical, as shown by the arrows below A and B. Since the truss is symmetrical and symmetrically loaded, the resultant of the load must pass through the apex of the roof, and as the two supporting forces must meet this resultant at one point, the two reactions must be equally inclined. Then, to complete the polygon of external forces, as we have drawn $b\ e$, $e\ f$ and $f\ a$, in order, passing over the frame to the left, draw next $a\ d$ from the extremity a of the load line parallel to the upward reaction at A, and then the line $d\ b$ parallel to the reaction at B, which must close on the point of beginning C.

At the point A we have equilibrium under the action of four forces, of which the two external ones are known. Therefore, taking them in the same order as before and commencing at f pass over $f\ a$ and $a\ d$ in the direction of their actions. Then draw $d\ c$ parallel to A B, denoting the pull on the joint A, and prolong this line until $f\ c$, parallel to A C, will strike f, the point of beginning. A C will exert a thrust. Passing next to the apex of the roof, we go down over the line $e\ f$ for the external force, thence up to C, and thence draw $c\ e$ parallel to C B. If this line does not close on e, the drawing has not been made with care. The stress $e\ c$ will show thrust on the apex from the rafter C B. As all the stresses are now determined we need not consider the remaining joint.

If the supporting forces had been more inclined from the vertical, the point d of their meeting in the stress diagram would have been nearer to C, thus diminishing the tension on A B. The inclination might be so much increased that d would fall on C, when the piece A B would become unnecessary, the thrust of the rafters being balanced without it. If d fell to the right or beyond C, $d\ c$ would be a thrust. If the two reactions are vertical, as will be the case when the truss is set simply upon the walls, the upward reaction will evidently each become ½ W and the point d will be found at d' the middle of the load line $b\ a$. The polygon of external forces has closed up and become a straight line, but in the analysis it must still be used. Thus we have $b\ e + e\ f + f\ a$ for the weights at the joints, and $b\ d' + d'\ a$ for the reactions. For the rest, the stress diagram will be found exactly as explained.

(To be Continued.)

Precious Woods.

Some of the metals are called "precious" because of their greater exchangeable value, beauty, &c. There are also some woods whose beauty, durability, and rarity fit them for gratifying the æsthetic nature of man, or to subserve some special and important purpose in the arts.

Lignum-vitæ (*Guaiacum officinale*) is the wood of a small tree of slow growth in the West Indies. The central portion of the trunk, or heart-wood, has a green color, while the outer, or sap-wood, is yellow. This wood comes to us either in the log or large billets, and from it many utensils are made that require toughness and durability. The fact that lignum-vitæ will not float in water like ordinary woods is a little surprising at first sight, but this shows how exceedingly compact the network of fibers are put together. Any one who splits a block of this wood experiences the truth of the old comparison, "as tough as lignum-vitæ." The wood, on account of its toughness, is much prized for the "sheaves" or wheels in pulley-blocks used extensively on shipboard and various other places where hoisting is done. The common name, lignum-vitæ, meaning "wood of life," comes from the ancient belief that great healing properties were contained in this remarkably tough wood. In the form of fine shavings or raspings it has long been used as a remedy for syphilitic and rheumatic diseases. The medicinal virtues reside in a rosin which is extracted from the wood, and is sold in the market under the name of gum guaiacum.

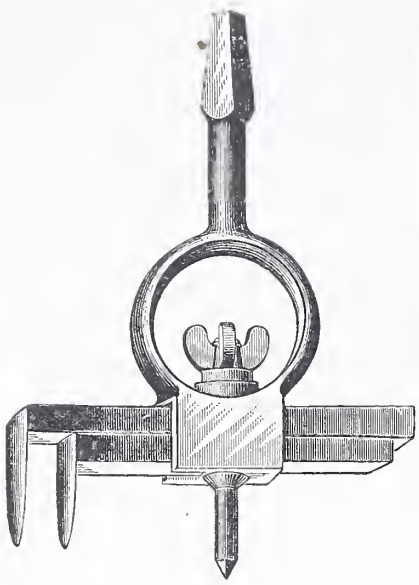
Boxwood (*Buxus sempervirens*) is another of the precious woods. The box tree grows in the forests in the south of Europe, and is regarded as a native in England, where it does not attain a hight of more than 14 feet, though in warm and more favorable countries it grows twice as high. There is a dwarf box that is closely related to this one, and is familiar to many in this country as an evergreen edging to walks and flower beds. Boxwood is the heaviest of European woods; it sinks in water. This wood is preferred to all others for the manufacture of flutes and other wind instruments, and mathematical tools. The most important service rendered by boxwood is in wood engraving, it being unrivaled for this purpose. Without boxwood we should have to dispense with many of our best pictures, as no other wood can take its place under the engraver's tools.

APPRENTICE.—You can't file a saw with a bill-file, so don't attempt it. If anybody goes to quizzing you about it just tell them that you saw a file.

NOVELTIES.

EXTENSION BIT AND WASHER CUTTER.

A combination tool bearing the name above given, two forms of which are illustrated in Figs. 1 and 2 of the engravings, is being manufactured by the Philadelphia Patent Tool Company, 821 Cherry street, Philadelphia. This tool is a convenience for carpenters, pattern makers, engineers and all mechanics working in wood. As an extension bit it will chip away or cut a hole from 1-16th inch to 1 inch deep, and from 5/8th to



Novelties.—Fig. 1.—Improved Washer Cutter and Extension Bit.

6 inches in diameter. Used as an extension bit, this tool will cut a larger diameter than other similar tools heretofore sold. The engravings so clearly represent the tool, showing its method of application and the different parts of which it is composed, that very little further explanation is necessary. The bits shown in two styles will fit in either

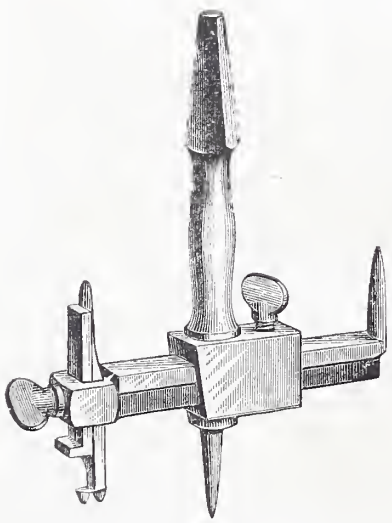
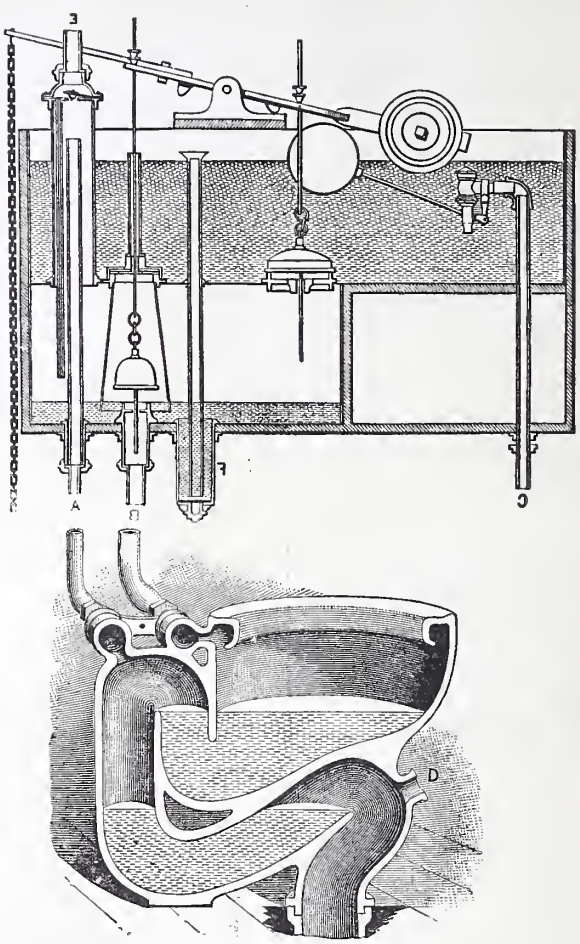


Fig. 2.—Another Form of the same Tool.

holder, so that the purchaser has the choice of having the two tools in one, or he can have them separate, and use either extension bit and washer or washer cutter alone. It has the advantage of being easily adjustible from one size to another, using only a set-screw.

THE TIDAL WAVE WATER-CLOSET.

Figs. 3 and 4 of the engraving show a section of the tank, and also of the basin of a new arrangement of water-closet manufactured by Messrs. H. Huber & Co., 85 Beekman street, New York. This closet has several features which will attract the attention of architects and builders, as well as practical plumbers. The basin is made in one continuous piece of earthenware, combining in itself both trap and basin, but having no valves in any part. The working mechanism is entirely confined to the tank and the levers for operating the valves, which extend down to the seat. This closet belongs to the class in which the contents of the basin are syphoned out. The method of accomplishing the syphoning, however, is unique. Upon pulling down the handle the valve in the bottom of the tank is opened, and the service box fills with water. This operation is automatically performed by pressure of the seat on a set of levers. When the pressure is removed from the seat the first valve closes, and the valve in the pipe B of the tank opens, and a flush of water at once begins. This flush of water takes place from a closed chamber. Consequently, a partial vacuum is at once formed, and the water would be stopped were it not for the fact that the pipe A connects the upper part of this chamber with the space between the upper and lower water seals. The engraving shows how the partial vacuum is formed, drawing the water out of the basin completely and establishing a syphoning action. When the service box is about three-fourths emptied, the level of the water falls so as to uncover the mouth of a small pipe leading up above to the valve in the pipe E This protects the seals, and the air is allowed to flow into the service box through the valve E, just above the top of the tank. The stem of the service box works through a leather packing and is consequently tight. F represents the valve pipe and the seal necessary at bottom of it. The pipe C is the ordinary connection, with the ball cock fitted with the usual hush pipe, to preveut any noise while the tank is filling. A large body of water is retained in the bowl, and the trap at this point has an unusual dip. There is also another trap below, the dip of which is also considerably deeper than usual. The operation of the closet is very simple and effective, and there is no rise of water beyond the proper level, either at the beginning or end of the flush, which is very large and effective. Both the bowl and the trap below are emptied of their contents during the flush, and their entire contents being discharged into the soil pipe, none remains in the trap.



Figs. 3. and 4.—Tidal Wave Water-Closet.—Sectional View through the Supply Cistern and Closet.

BURGLAR ALARMS.

The demand for a simple, cheap and sure protection of doors against unlawful visitors has long been felt by householders. A device designed to overcome the danger of sneak thieves and intruders generally is represented in Fig. 5 of the engravings. It is a gong-bell so arranged as to be applied on the

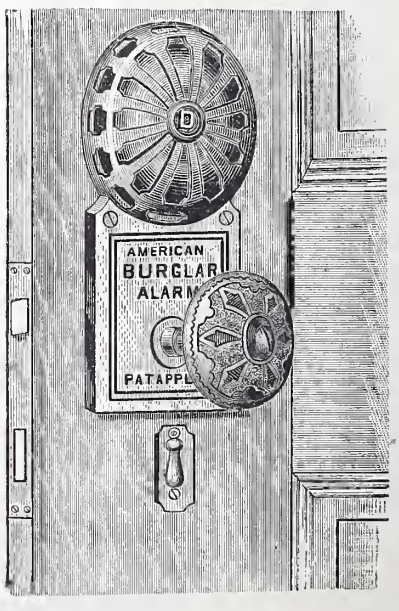


Fig. 5.—Burglar Alarm for Attachment to an Ordinary Door Knob.

inside of a door, and to operate by means of the spindle of the ordinary lock. When placed upon a door in this manner, the latch or catch of the door cannot be moved without sound-

ing the alarm. By slipping a lever provided for the purpose, the gong is silenced for the time being, allowing the door to be used without the constant alarm. By this means it will be seen that when the door is in use by the family, as in the daytime, the alarm need not be sounded, but on reversing the lever on retiring at night the alarm is fixed so as to make a noise whenever the knob of the lock is turned. It is so constructed that it will fit nearly every door, and, what is an advantage for those who do not live in their own property, can be put on and taken off from a door without defacing it. It is quite desirable for sleeping apartments, making it practically impossible for a thief to enter a room without arousing the occupants. The article, which is manufactured by Messrs. Decker & Denning, No. 116 Washington street, Chicago, is handsomely finished in nickel plate, and may be considered an ornament to the door to which it is attached.

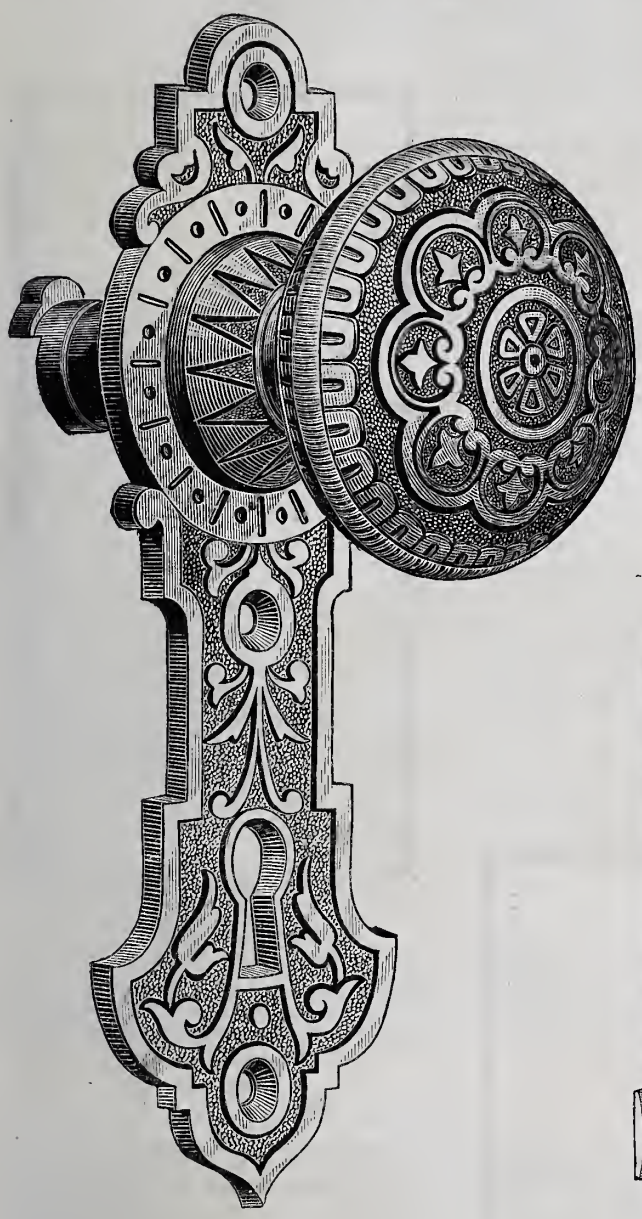


Fig. 6.—Improvement in Door Locks.—View of Rose and Key Escutcheon, Knob and Shank, showing Cam for Operating the Latch.

IMPROVEMENT IN DOOR LOCKS.

The Chicago Hardware Mfg. Co., Chicago, Ill., are calling attention to the Niles Patent Mortise Door Knobs and Locks, a complete view of which is afforded by the accompanying engravings. The special features in this lock to which the company direct attention are, that screws in the shank of the knob are dispensed with entirely; there are no washers, no spindle and no hub in the lock, and in their place is the knob shank only, extended and provided with a lug and cam on its inner end, the cam performing the functions of the hub in the common lock. Its parts are clearly shown in the engraving, the cam on the end of the knob shank being shown in Fig. 6, while the yoke in which it works is clearly shown in the details of the lock, Fig. 7. The knob acts directly upon the latch without loss of motion. The rose and key escutcheon, as shown in Fig. 6, are in one piece, extending above and below the lock, so that the long screws necessary for securely fastening furniture of this kind will enter the solid wood and make a firm attachment to the door. The inner end of the knob shank is attached by the lug directly to the lock, while the outer part is supported in the rose, so that there is no possibility of the knob coming off until the screws in the roses are drawn out and the knob can be tipped to one side. Another feature to which the manufacturers direct attention is that the number of parts required to operate this lock, as compared with the old style, is reduced one-half. In the construction of the lock the latch bolts are made reversible without taking off the cap. The inside works are made strong and accurate, the tumblers being stamped out of wrought iron and the bolts made of hard brass or bronze. The lock has been sufficiently introduced to be thoroughly tested. It has been subjected on public buildings, railway car doors and like places during the last three years to the most severe and trying tests that could be found, and where the least objectionable feature would be quickly manifest. After a test of this kind, the manufacturers offer it strictly on its merits. As may be seen by the engraving, a very happy design is incorporated in the ornamental features of the rose and key escutcheon. The lock is attractive in appearance, and, we have no doubt, will be a favorite in the trade.

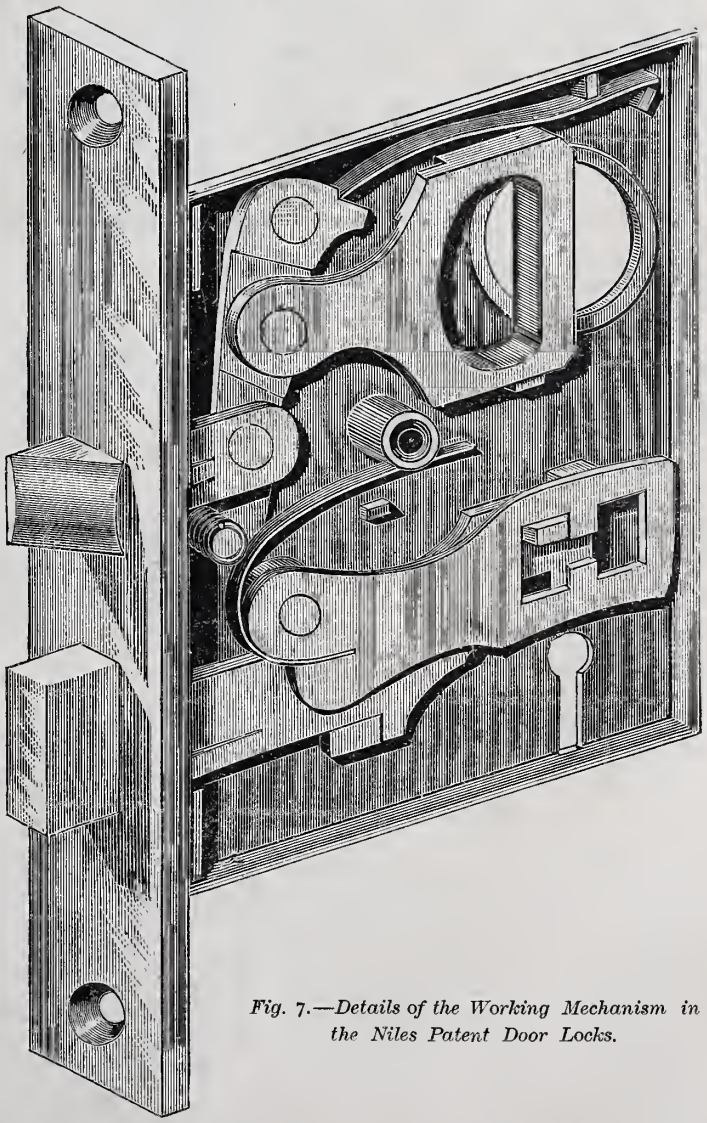
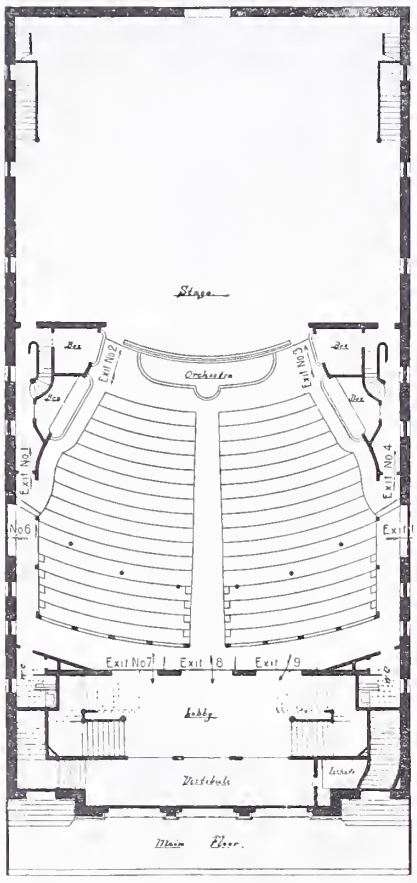


Fig. 7.—Details of the Working Mechanism in the Niles Patent Door Locks.

MESSRS. W. A. FRENCH & CO.,

Third and Vine streets, Camden, N. J., have issued a catalogue of builders' supplies which is somewhat novel in character and which contains material that will be of interest to contractors, builders and architects. A number of designs of patent center-pieces, brackets and other articles of finish, including plaster cornices, occupy the first 75 pages of the book. The special feature of these goods is the construction employed, which makes the work suitable for any kind of building. The manufacturers state that the cost of elaborate, ornamental cornices for rooms constructed under this system, is about the same as the cost of plain cornices of the same girth. A large variety of embellishments and ornaments is possible with cornices of this kind, rendering it more desirable than similar patterns with the old construction. Some designs for marbleized slate

mantels follow, prefaced by directions for setting up, a feature that is of interest to many mechanics who have not had experience in this line. Following this are designs and prices of cut glass for vestibule doors and transoms. A number of designs are also given, together with prices of embossed glass. Besides these features, the catalogue contains a number of designs of grates and grate-settings, registers, &c.



Topeka Opera House.—Fig. 1.—Plan of First Floor.—Scale, about 35 Feet to the Inch.

We understand from Messrs. French & Co., that very large editions of this catalogue are published and that they are sent free of charge to builders who apply for them.

READY-MADE HOUSES.

At different times we have had occasiou to answer inquries from correspondents with regard to ready-made buildings. Accordingly we take pleasure in directing their attention to a catalogue of house plans, with details and descriptions, adapted to temperate and tropical climates, recently issued by the New York and Flushing Building Co. The illustrations in this book represent buildings constructed by this company for local and export markets. The post office address of the company is Flushing, N. Y. Portable houses made by this company are constructed under patents controlled by it, and are first erected at the factory, each piece being marked in position, so as to identify it when the building is put up at its destination. A drawing represeuting the building is similarly marked, by which means unskilled labor is able to put up the buildings wherever required. The catalogue embraces houses ranging in size from a single room 9 by 12 feet, to houses two stories high, with 9 and 10 rooms, halls, &c. Houses of a single story, with veranda on all sides covered by the main roof, containing 10 rooms, are also made. Besides dwelling houses, various outbuildings are also made by this company on the same general plan. Churches are also prepared. This catalogue is calculated to meet the wants of all who are interested in the subject of portable houses, and it answers many questions which continually arise with reference to a subject of this kind. In addition to the designs already referred to, a number of perspective views of modern houses of moderate price are also given, together with a number of plates of moldings, sash, doors, blinds, balusters, newels, &c.

Topeka Opera House.

Some citizens of Topeka, Kansas, under the management of Messrs. Haskell & Wood, are about building an opera house which will be a credit to the city in which it is erected as well as to the designers. Through the courtesy of the architects we are able to lay before our readers floor plans at this time. The proposed building will be 70 feet front by 140 feet deep. The ceiling will be 46 feet high from the main floor of the orchestra. The main floor will be inclined 11 feet from the entrance to the stage, so that each person can see over the head of the one in front. The same feature will be carried out in the galleries. The stage is 60 feet deep and 67 feet wide. Under the stage ample dressing rooms, property rooms, green rooms, &c., are provided which are well lighted and ventilated. These rooms are reached by stairways 4 feet wide leading from each side of the stage. The proscenium wall will be of brick and extend entirely through the roof. Immediately over the stage will be a skylight 10 by 16 feet, the sash being held in place by a combination of rope and a web of cotton cloth so as to be lowered at will or dropped automatically in case of fire. The auditorium is 52 by 67 feet, with four private boxes on each floor and private stairways leading to them. The entrance to the building is by means of three doors 10 feet wide and 12 feet high, leading into an outer vestibule 40 feet long and 8 feet wide, in which are the ticket offices and the stairway leading into the upper gallery. From this vestibule three doors, each 9 feet wide, lead into an inner vestibule 14 by 56 feet, containing two flights of broad stairs 6 feet wide leadiug to the balcony. There are in this inner vestibule also three doors, each 9 feet wide, opening into the main auditorium.

We might describe in detail other features of this plan which has much to commend it,

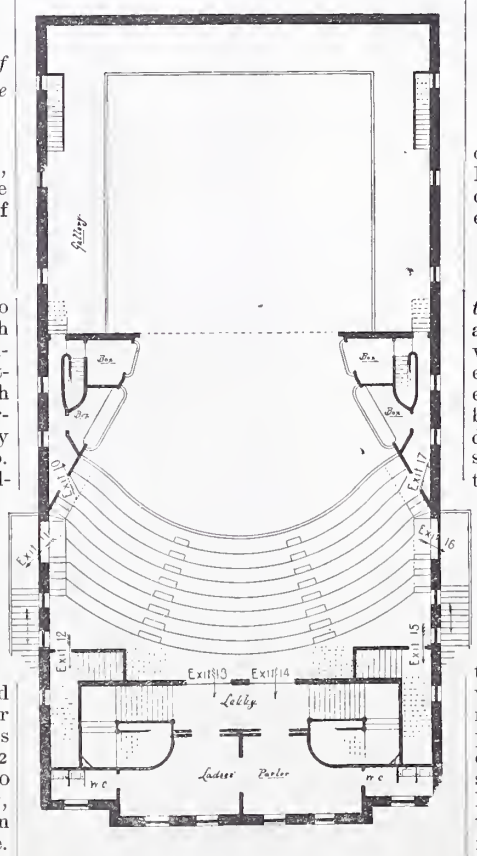


Fig. 2.—Plan of First Balcony.

but they will be observed by inspection of the engravings, and therefore we need not occupy space with them in this connection. The proscenium opening is 35 feet wide, and 38 feet high in the clear. Altogether there are 20 exits to the building, the combined width of which is 104 feet. All the doors are to open outward. The drop curtain will be arranged to lift bodily without rolling, and it is as well, as the scenery will be made of canvas lined with asbestos felt, rendering it practically non-combustible. The building will be heated by steam, and the ventilation will be after the most approved plan. The stage will be supplied with perforated water pipes over the scenery, arranged so as to flood the stage with water in case of fire. These pipes will be arranged so as to make it possible to operate them from a number of different places throughout the building. It is expected that this building will be ready for

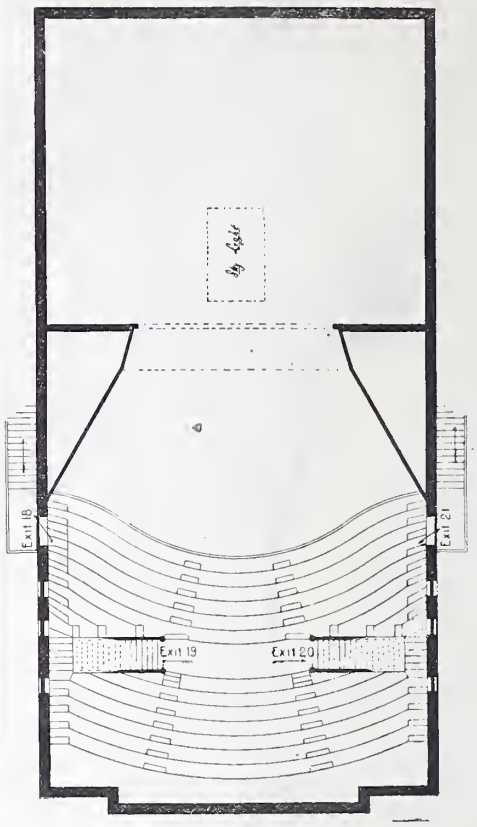


Fig. 3.—Plan of Gallery.

occupancy about the 1st of September next. Its projectors are confident that in safety, comfort and capacity of stage, it will be unexcelled in the country.

To Color a Pine Floor.—The *Art Interchange* instructs its readers how to color a pine floor which is to be partially covered with rugs, a fashion that prevails to a great extent just now. Obtain at any house-painter's store turpentine and linseed oil (not boiled). Ask the clerk to put a little Japanese drier iu the turpentiue. Buy either burnt sienna or Vandyke brown, or both, according to the color of the rugs and the tint on the walls. These colors come put up in tin cans, smaller but otherwise similar to tomato or fruit cans. After the floor has been washed thoroughly clean and dry, begin by mixing in another receptacle the oil, turpentine and paint. The mixture should be so thin that it will run with liquid readiness. Lay it on with a brush, stroking the brush the way of the grain of the wood. Protect your hands with old gloves, and go over the floor with a rag; in fact, you will need two rags, one pretty well charged with paint, to rub in every crevice, and another rag to rub off any superflous paint. Do not stop in a straight line across the grain of the wood, but carry the brush irregularly down, taking a hint from nature's lines in the wood. By mixing the burnt sienna and Vandyke brown a rich color will be produced without using the paint thick. The mixture should be so thin that the grain of the wood will show through. If too much turpentine is used the paiut will rub off; if too little, your room will need more days to dry. Use twice as much oil as turpentine. Do not economize the oil, and be as prodigal in rubbiug as your strength will permit.

CORRESPONDENCE.

The unusual amount of space devoted to the set of house plans which forms the leading feature of this number, precludes the possibility of our devoting as much space to correspondence as is our usual custom. It is from no lack of material that this department is reduced to such narrow limits. Those who have favored us with letters, and who fail to see them published in this number, as they had reason to expect they would be, we trust will bear with us patiently. Our effort is to present the most entertaining paper possible each time, and when one department occupies unusual space, something else must be sacrificed to it.

The contest of the seventh competition, full particulars of which are contained elsewhere in this number, is of special interest to builders in particular. We have frequently heard builders complaining of inadequate specifications upon the part of architects. It is quite the proper thing, in the estimation of some, to find fault with the specifications that are presented to them upon which to base their estimates. Sometimes the criticisms apply in like manner to the drawings. The set of drawings which becomes the basis of this contest has been prepared with uuusual care, and before publishing has been criticised very carefully, in view of the close scrutiny they would necessarily receive. While they are not supposed to be absolutely perfect, they are in all particulars sufficient as a foundation for a model specification. We invite builders particularly to give attention to this competition. There is presented a fair opportunity of showing the practical work of builders alongside of the so-called theoretical work of architects. The best specification, irrespective of the source from which it comes, is what we desire to obtain. The advantage to our readers will be the comparisons which may be made between the several efforts submitted. We therefore urge builders who are disposed to criticise the specifications of architects to enter this contest in an effort to show, if possible, that a builder can specify construction, workmanship and materials to better advantage than an architect. At the same time we would suggest to the architects that it is not well to allow the builders to achieve a victory in this matter without a contest. We expect a fair showing from them also. In the estimation of many people it is a much simpler matter to prepare a specification than a set of drawings, and, therefore, we have reason to anticipate larger entries in this competition than in almost any other one instituted by this journal.

Brick Machines

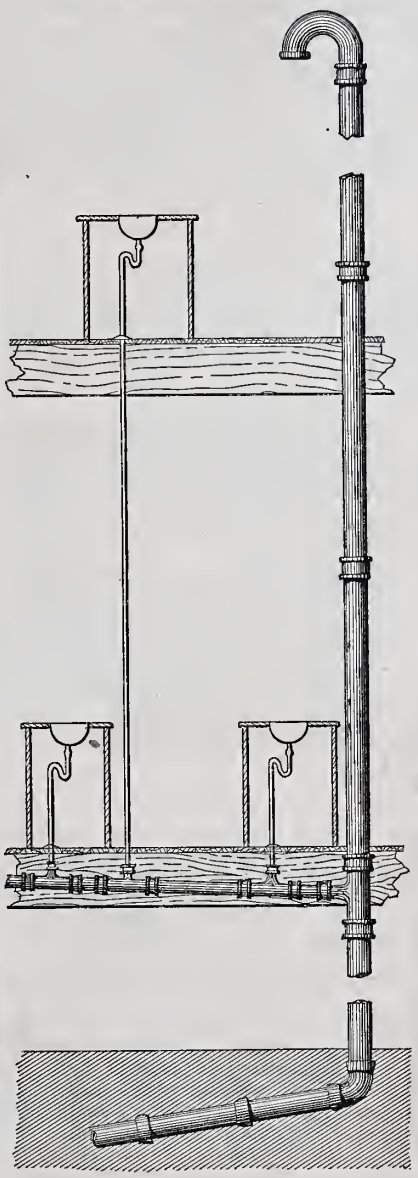
From D. R., *Lancaster, Pa.*—In the June number a correspondent asks for some information with regard to brick machines. For his information and also that of others I would say that there is a machine working in a yard in this city, the location of which was specially selected as presenting a very severe test of the value of a brick machine. The soil is of very poor quality, full of stone and very hard to work. The machine is known as the Henry Martin brick machine, and has been running under these circumstances for two seasons, making from 20,000 to 25,000 brick per day. The product compares favorably with any brick made in hand yards. The brick are used right along, and the cheapness of their product enables the owners of the yard to secure all large contracts and even to ship to a distance The Martin machine will make good brick from any clay that will admit of hand working, and can be run so as to produce 35,000 bricks per day, though for regular, steady work I belive 20,000 is sufficient. The machine referred to is manufactured in this place.

Figuring Pocket Rules.

From A. R. R., *Marysville, Ohio.*—In one of the back numbers of the paper there was some discussion with reference to the figuring on pocket rules. One correspondent claimed that rules were figured backward. From long experience in using pocket rules, I am disposed to defend the figuring as I find it. A mechanic ordinarily grasps the rule with his left hand, leaving his right hand to hold a pencil or knife against the desired point for which he is measuring. If numbered from left to right, the left hand would nearly always be in the way of the other hand. These two points, it seems to me, are of sufficient importance to warrant the present way of numbering.

Piping for Three Wash Basins.

From C. M., *Auburn, N. Y.*—Inclosed please find a sketch showing the manner in which it is proposed to pipe a house for three wash-basins, each basin to be provided with a trap. A vertical pipe goes through theroof, and is finished with a bend, as shown in the sketch. A plumber maintains that the construction represented will make a good job, be proof against sewer-gas and satisfactory



Piping for Three Wash Basins.

in all particulars. I am of the opinion that the arrangement of the traps is wrong on account of syphonage. I desire to ask the question if one trap will not syphon the others in the proposed plan ?

I am of the opinion that it is not necessary that every water-closet should be supplied by a cistern. The contrary opinion is advanced. I desire to ask if there are recorded cases of disease attributed to the connection of a water-closet to the trap supply pipe ?

Note.—The arrangement of pipes shown in our correspondent's sketch, which we reproduce herewith, is open to the objection which he makes, and to the further objection that there is a considerable amount of waste-pipe which has no direct ventilation. While the main soil-pipe is carried through the roof in the proper manner, the three wash-basins which are shown are not ventilated in any manner here indicated. This we consider quite objectionable. More especially is this wrong from the fact that syphonage may occur, leaving the apartments without the slight protection afforded by the seal of the trap. Referring to our correspondent's second question about known cases of disease having their origin in the use of water for closets direct from the main supply pipe, we would say that at this time we do not recall any such instance, but that on general principles it is objectionable as such connections are commonly made.

Painting a Cottage.

From W. P. S., *Chester, S. C.*—Please advise me as to the best color to paint a small cottage. If tinted, what color of trimming should be used to match ? What color is best for the interior of a house ?

Answer.—Questions of this kind are often proposed, and we get them in various forms from readers in different parts of the country. It would seem that the writers suppose there are definite rules for painting the exterior and interior of houses that can be depended upon the same as mathematical rules for performing calculations. Nothing could be further from the truth. If there is any one thing in which individual discretion and taste is to be exercised about a house, it is in the matter of painting it. Almost every color is used, one way and another, about houses. Some people prefer one thing, others another. What is very fashionable in one community is scarcely seen at all in another. We cannot answer our correspondent's quesquestion. We could not present any answer whatever to which exception would not be taken upon some ground or other. Were we to indicate our own preference, which at most would be all we could do, it would be necessary to know something of the architectural characteristics of the house, its location and general surroundings. The colors, contrasts and harmonies, we think, would be dependent upon the surroundings. Our correspondent will doubtless obtain hints that will help him by an examination of the new work entitled "Modern House Painting," price $5. This, however, as we have elsewhere indicated, is a work of more advanced principles, and is less calculated to serve in the ordinary requirements of every-day life than might be wished. It will serve to show, however, the vast range from which choice may be made.

Estimating Power.

From J. R. L., *Lowell, Mass.*—In a recent issue some rules were given with regard to calculating speed. I think it would not be amiss to discuss in the paper rules for estimating power. When the number of horse-power necessary to drive a given machine is known, and the size and width of pulleys determined, what width of belt should be employed ? For example : Suppose 15-horse-power is required to drive a given machine. The diameter of pulley is 10 inches, what is the width of belt required ? Is there no rule by which power may be calculated by the width of belt, taking into account the speed of the pulley ?

Portable Tool Box.

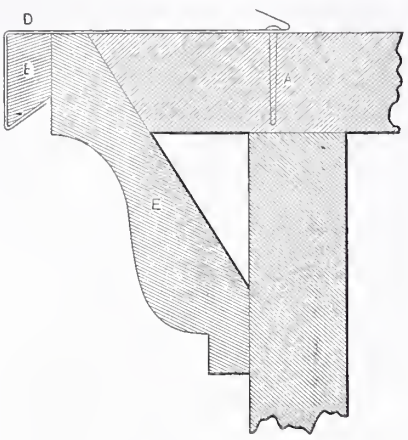
From W. H. W., *Fall River, Mass.*—For the benefit of those who have been inquiring about portable tool boxes, I will describe what I am using. The box is made out of stuff ½ inch thick and 10 inches wide. The completed box is 28 inches long inside, 10 inches outside measurement, and 8 inches deep. It was made a complete box, and when done it was sawed open 2 inches from the top, and the top hung with three small butts. A lock is put on the front. Two common drawer pulls are placed on the ends for handles for picking it up. In the top part a lid is fitted by buttons and is deep enough to hold the saws. In the lower part there is plenty of room for the other tools. A box of this character is more convenient than a common tool box and can be carried on the shoulder when necessary, and tools are all locked up at a moment's notice. I have my chest so constructed that this box will go into it, so that it can be conveniently packed away when the chest is to be moved.

From W. C. P., *Glasgow, N. Y.*—I require to renew the request made some time since with regard to portable tool boxes. At the time I. E. A. said he was working at the idea. I think, if he has persevered, he must have worked it out by this time. If so, I hope he

will give the readers of *Carpentry and Building* the benefit of his experience. I think the subject of sufficient interest to warrant it receiving the attention of the readers generally.

Finishing the Edges of Tin Roofs.

From W. P. J., *Auburn, N. Y.*—In a recent issue, I noticed a letter from W. K. concerniug the finish of the edges of tiu roofs. He speaks of methods already published which I have not had the pleasure of inspecting. If the plan I inclose is different from those already published, I shall be pleased to submit it to the readers of



Finishing the Edges of Tin Roofs.—Fig. 1.—*Sketch Showing the General Plan Proposed by W. P. J.*

the paper, in order to ascertain what is the value of the same. What I claim for the plau is that it presents a perfectly smooth face, and also forms a drip for all the water that falls on the roof below the gutter if a standing or bead gutter is used. It does not allow the water to run down the face of the crown molding, as is the case where the tin is merely turned over and nailed. By this plan, further, no nails are exposed to the weather. Accordingly, there is no danger of the strip working loose and being torn up by the wind. Referring to Fig. 1, A represents the roof board, B an edging strip which is nailed to the face of the same. C, in Fig. 2, represents the tin as formed in the shop, with the usual lock. D, in Fig. 1, shows the strip on, ready to commence the roof. No cleats are used in connection with this strip, but it is nailed uuder the edge to which the roof is locked, as shown in the sketch. In Fig. 3 the method of cutting the strip for finishing around corners is shown. The tin is first formed over the edge and then cut,

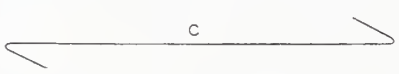


Fig. 2.—*The Manner of Forming the Tin.*

as shown in that sketch. It is placed on the edge of the roof, as shown in Fig. 4, and, after the end G has been fastened in position, the end K is brought around in place and fastened, as shown by H. By properly cutting the tin, a lap for soldering, so as to make a water-tight joint, may be made at J. The custom is to give the strip of tin about 1 inch lap. This manner of finishing the edge of a roof leaves the surface clear from any point of view. It has always seemed strange to me that so many tinners should spend the time required to nail the edge of a roof, which always causes it to look rough and ugly, when it might be done much quicker and in a better manner by this or some analogous plan.

Paints for Tin Roofs.

From H. W. B., *Bellaire, Ohio.*—I noticed in a recent number of the paper the statement that whito lead is not desirable for painting tin roofs. Will you please inform me what is the best paint for tin roofs, as I have a roof of this description which I desire to paint in a short time?

Answer.—From experience we believe that those paints are best for metal surfaces which carry the largest body of oil. Accordingly we recommend for use ocher and materials of a similar kind, in preference to such paints as oxide of iron or iron ore paints, as they are frequently called. The objection to these is that the the least amount of oil is necessary in their preparation. We believe this fact accounts for their extensive sale and general use throughout the country. Since paint is very generally sold by the pound, and as oil is one of the most expensive ingredients, those paints are most profitable for sale which weigh the most for a given amount of surface to be covered, and which take the least amount of oil in their preparation. We have briefly indicated the reasons of our preference in the matter of paints for roofs, leaving our correspondent to make his own application as circumstances may direct. We believe that oil is the really protective ingredient for metal surfaces contained in paint, and that therefore that paint is best which carries and holds the largest amount of oil.

Tin for Valleys.

From C. H. H., *Josco, Mich.*—I desire to inquire which is preferable for valleys on a shingle roof, a good quality of tin 14 inches wide, or finishing the valleys with shingles, adding extra courses to make up for any difference in the length of rafters. Tinners claim that tin is the best. I desire to inquire how long will tin last ou a valley.

Answer.—Referring to our correspondent's last question, it is impossible to state the length of time which tin will endure, for several reasons. In the first place,

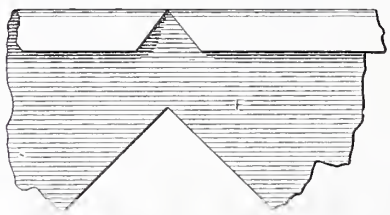


Fig. 3.—*Cutting the Tin to Finish Around a Corner.*

there are various grades of tin in the market, and there are various atmospheric conditious which affect the durability of tin. Aside from this, the manner in which the tin is laid, the material with which it is painted, and the way in which it is used, referring particularly to the accumulation of dirt, leaves, &c., which sometimes obstruct valleys, have a material bearing upon the subject of durability. Referring to the former question, we presume it is one which our readers will desire to discuss, and upon which opinions pro and con will be expressed. Our own preference would be for a good tin valley, rather than an attempt to fiuish a roof

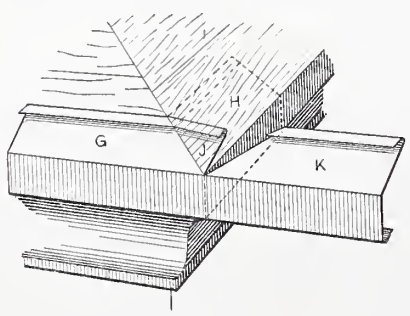
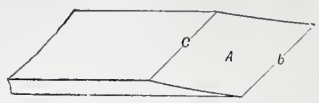


Fig. 4.—*Finish of a Corner.*

without a metal lining in the valleys. There are several reasons for this. The work is probably quicker doue with metal valley than with a finish of shingles, aud therefore it is cheaper. Less actual ability upon the part of the mechanic shingling is required to make a good job in connection with the metal valley than in furnishing a valloy without a metal lining. With these general remarks we submit the question to our readers for such discussion and notes of experience as they may see fit to furnish for publication.

Japanese Tools.

From X. Y. Z., *Philadelphia.*—Wheu the Japanese carpenters were putting up their building at the Centennial Exhibition, I noticed that they were able to sharpen their chisels on the oil stone very quickly, and, upon examination, I found the reason to be that they used a grindstone of quite small



Japanese Tools.—Fig. 1.—*Diagram showing the Curved Surface used in Japanese Cutting Tools.*

diameter, and having a small wooden frame to hold the plane blades on. The face A, was ground quite curved from *b* to *c*, as in accompanying sketch, Fig. 1. This gave the advantages which are shown in Fig. 2; first, the amount of area to be oilstoned was so small that the sharpening could be done quickly; and, second, by letting the blade touch the stone at the back as well as at the edge it could be kept steady on the oil stone, and so oil-stoned true. Of course both the grindstone and the oil stone are required to be kept flat and true. I did not see how they kept the grindstone true, but I did happen to see them true an oilstoue, which was done

Fig. 2.—*The Tool in Contact with an Oil Stone.*

with a piece of hard wood, supplied with sharp sand and water, the oilstone being rubbed thereon. The area to be stoned on the other side of the chisel was very slightly reduced by a touch on the grindstone, depressing the surface withiu the space *d*, inclosed in dotted lines in Fig. 3. They used two stones; the first and freest cutting was used with hot water, and the second (of a green tint) was used with oil. Both of them seemed of better quality than the Arkansas and

Fig. 3.—*Manner of Grinding the Back of the Tool.*

and Wichita stones, or the Turkey oil stone, the finishing one having a very fine edge, and yet appearing to cut freely, leaving a bright polish on the tool.

Uncle Dave's Improvements.

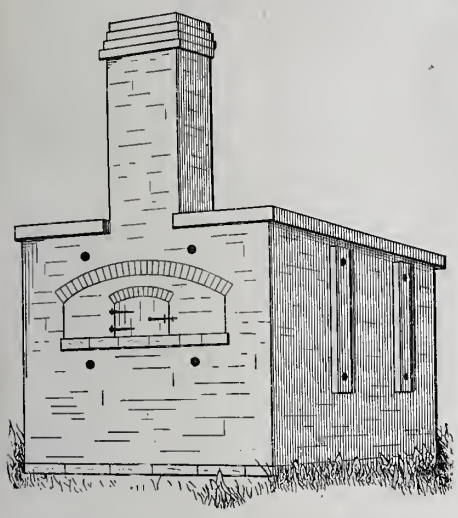
From N. D., *Boston, Mass.*—Uncle Dave is an old man whom we employ for getting out finish and work of a similar character. I made him a work-bench some time since, and when he saw it he condemned it in severe terms, and said that he had never seen a bench made right yet. I replied that if the bench did not suit him he had better make one himself. He answered that the bench was good enough as far as it went. I wanted to know what further he required. He said that it wanted some slides to pull out on which to saw lumber. He asserted that he did not want to run all over for saw-benches. I appreciated the point, and accordingly the slides were provided, aud there he works right on his own ground, saws and planes, and is never bothered by other hands running off with his saw-benches. It does not take longer to provide the slides than to make two saw-benches.

When I first saw his draw-shave I smiled and asked, "What is that for?" He was rabbetting door frames. Said he, "I will show you." He took the tool and shaved a

rabbet out in short time. Finally he told me that I might give that idea to the readers of *Carpentry and Building*, along with the bench slides, if I saw fit. The tool works well, and I have no doubt many of your readers will appreciate the ingenuity of the inventor. Possibly some enterprising manufacturer will seize upon the idea and make the tools for sale.

Bake Ovens.

From C. N. P., *Marshall, Mo.*—I inclose sketches in answer to the inquiry of E. T., Cottonwood Falls, Kansas, concerning brick ovens. The oven as represented is 5 feet



Bake Ovens.—Fig. 1.—Perspective View of Oven as Constructed by C. N. P.

wide by 6 feet deep. It may be reduced, if desired, to smaller dimensions, but the proportions here given should not be destroyed. Other styles of ovens are sometimes built adapted to the requirements of bakers, but they are not practicable on a small scale. I have built ovens of the kind here represented

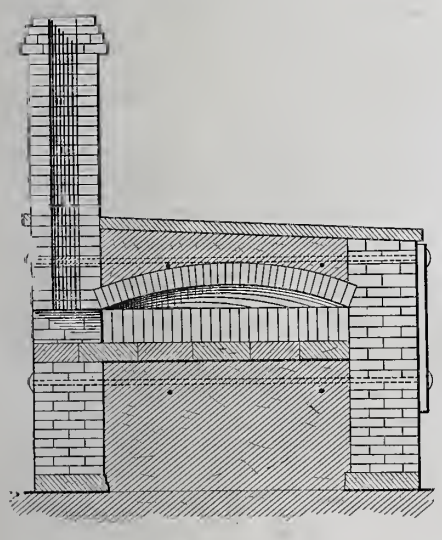


Fig. 2.—Longitudinal Section.

8 by 10 feet, with 16 inches from the floor to the bottom of the crown. The drawings so thoroughly represent the construction that further description is hardly necessary.

Calculating an Octagon Bay Window.

From J. D. S., *Middletown, Conn.*—I submit the following rule for getting the sides of an octagon bay window, the width being given. Few architects, I find, give anything more than scale measurement for their bay windows, hence a short rule is of great benefit to practical builders. Without entering into a calculation showing how the results are obtained, I submit the rule. I do not pretend that it is absolutely correct, but it approximates so closely to correctness as to be satisfactory for practical purposes. The variation is only 1-32d of an inch to the foot. The rule is as follows: The whole width of the octagon in feet multiplied by 5 will give the side in inches. Example: Suppose the whole width of an octagon is 8 feet. Multiplying this by 5 gives 40 inches as the length of the side. So 40 inches = 3 feet 4 inches, the length of a side in convenient shape for use. The actual width would be 3 feet 3¾ inches, which, as will be seen, makes about ¼ inch variation in 8 feet. To get the lengths of the sides of the angle, multiply the whole width by 3½, which is, in the present instance, 8 feet multiplied by 3½ inches = 28 inches, or 2 feet 4 inches, which is the length of the sides of the angle.

Laying Off an Octagon by the Pocket-Rule.

From F. A. R., *Kendaia, N. Y.*—On page 97 of the May issue of *Carpentry and Building* for 1880, a correspondent, whose initials are J. P. F., says that the lines on the pocket-rule marked M and E will show the gauging distance on a square stick to form an octagon. The gauge on the M line works from the middle of the timber, and that on the E line works from the edge of the timber. Now, if this is the case, the octagon scale on my square is not correct. These gauge-lines on pocket-rules may happen to come very nearly correct, but they are not mathematically correct. My interpretation of the M and E lines on pocket-rules is that they indi-

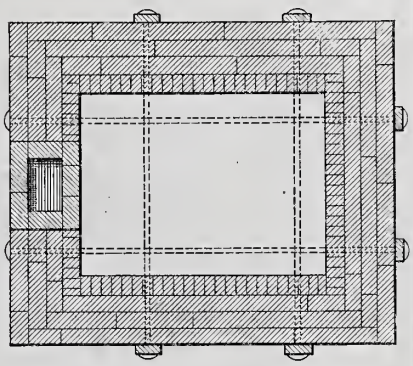


Fig. 3.—Plan.

cate that the lines on which they are plaeed are divided according to the metric and English linear measure respectively. Am I right in this matter?

Answer.—Without knowing just what rule our correspondent is employing, we cannot answer his question. It, however, should not be a difficult matter for him to determine it for himself. The difference between inches and the divisions of the metric scale is readily discernible. Simple inspection of his rule should determine this matter. If, however, he is still at a loss, we shall be pleased to serve him further if he will send the rule, or will, preferably, make an accurate drawing of the two lines in question and the divisions shown upon them.

Tin Roof Over Engine Room.

From J. W. B., *Dalton, Ga.*—I desire to inquire how it will do to cover an engine room with tin where the exhaust will keep the top wet a great deal of the time and the heat from the engine below will cause the under side to sweat, especially in cold weather. Will tin be serviceable under such circumstanees and will it stay painted?

Answer.—The conditions described by our correspondent are very severe for a metal roof of any description. A tin roof thorougly constructed of good material can be made to answer a fair purpose under the circumstances. We would advise sheeting the roof with matched flooring, taking care that it is laid very tight. Over this we would lay felt or building paper, and upon this in turn would lay the tin roof. By this construction the sweating which he anticipates upon the under side will be in a great measure, if not entirely, overcome. The dripping of the exhaust on the upper side of the roof is not as great a danger to the durability of the material as the sweating on the under side, for, if the roof has any considerable pitch, it will run off the same as the water from a rain. However, its constan presence and the character of the water itself thus formed makes it quite an enemy to a tin roof. The tin should be carefully painted with the best material for the purpose. As we have repeatedly advised, we would not use oxide of iron or the so-called iron ore paints for such a purpose. We would prefer ocher or vermilion or some other similar body, the object being to select that which will carry the largest proportionate amount of oil. By painting the roof thoroughly before it is used at all, and by renewing the paint at frequent intervals according to the wear, we think a tin roof can be made to answer under these circumstances almost as well as any material available. Slate would probably be better in some respects, but it also has its own peculiar disadvantages for places of this kind.

Strikes as a Symptom.

From A. B., *Columbus, Ohio.*—I have just read the article entitled "Strikes as a Symptom," published in the May number of *Carpentry and Building*. I approve of some of the remarks made therein. Strikes, I think, generally do more harm than good. However, the idea is conveyed that it is the labor strikes that are checking building operations. It is also asserted that high wages advance rents. There are no unions in the building trades here, but there has been a perceptible check in building, and it is without wages being increased. Wages are about the same as last year, therefore the check in building operations must be caused by something else than strikes. As for the increased cost of building being the cause of higher rents, this seems to me to be erroneous. Would anybody suppose that if building could be done for one-half the present cost that rents would go down? This would have a tendency to put rents up. For the purpose of making the idea clear, call the buildings and improvements capital. The return to this capital we will call interest, but the return for the land we will call rent. As I stated in a former communication, rent swallows up all gains in production. If the present power of labor to produce were doubled, it would not increase wages nor interest, but it would increase rent, and the amount of rent a lot will bring fixes the value of the lot. When industries recover from a depression, rent closely follows and swallows up all gains. This causes land values to go up beyond what labor and capital can profitably pay and live. In fact, it is a lockout of labor and capital by land owners. It is only when rent fails to keep pace with the increase in production that business is active. If rent should go ahead of the gains in production, a check takes place until rents readjust themselves at a lower level. Therefore, it seems plain that if buildings should cost double as much as now, it would not have a tendency to check building operations, but rather to reduce the value of land. Rent would be less, but interest would be more. It is not at all necessary that builders should work for nothing in order to keep things going, for that would have no effect as to results.

Note.—We fear our correspondent has not mastered the subtleties of political economy. We present his letter because it expresses views that are somewhat novel and which may set many of our readers thinking. That his conclusions are based upon fallacies, we think all will readily agree, but just how to point out those fallacies and how best to present the matter in a way to convince him of the erroneous conclusions which he reaches, is a subject which, as in a former case, we think best to leave to our practical readers. Topics of this kind, as we have heretofore remarked, are just a little outside of the field to which we think this department of the paper should be devoted. As such questions, however, are occupying the attention of mechanics generally at the present time, we see no harm in allowing a small amount of discussion.

A Characteristic Description.

From E. C. B., *Winstead, Conn.*—I have been reading some of the descriptions of articles illustrated in a number of the papers, and

I think I have succeeded in discovering the secret of their composition. I think I am able to describe a simple subject quite as well as it is done by the large majority of editorial writers. I will submit a specimen. Take almost any subject. For example, a scaffold bracket: "This is a very neat and tasty design. It is simple, elegant, and is in correct keeping with a great refinement of taste and a high degree of æsthetic culture. The simplicity of the plan, and the unaffected manner in which the designer expresses it, cannot fail to show its picturesqueness, which, taken in connection with its utility and the er—ah—harmonious blending of the whole, together with its elevation of character, shows its peculiar adaptability to persons in the higher walks of life."

Instructions in Bricklaying.

From P. BARNES, *Springfield, Ill.*—A well-arranged statement of the courses of study, and of some parts of the apparatus of Cornell University, has recently been quite largely quoted and referred to in the public press, and it suggests this thought, long entertained by me, that a course could be use fully given in the art of bricklaying at our schools where instruction in practice or "shop work" is offered to the student. This can be more easily done for the reason that the materials to be used are of the most inexpensive kind in their first cost, and after being laid by one set of students, in some kinds of work at least, the brick could be torn out, cleaned, and used again by another set, if desired. So far as my own observation has gone in several different cities, the ordinary bricklayer is extremely deficient, not to say ignorant and heedless, in the practice of his art. It is true that much of the cheap, shiftless work that is done is compulsory on the part of the workman, for the contractor or employer will have only that kind or none, and the workman must do as he is bid. At the same time it is true that these workmen, when set upon another job where solid work is needed and absolutely enjoined upon them, find themselves wholly unable to do a better grade of work.

It would not follow necessarily that young men could not detect and prevent such work, which often becomes so inferior and mean as to be incredible, without any such course as this which is proposed, but half a dozen illustrated explanations or lectures, with actual careful practice afterward, would give the average student a far better footing among workmen in any attempt he might be required to make to correct their errors.

An incidental advantage of such instruction, which is well worth mentioning, is this, that in nine places out of ten in which such students would be likely to be while spending their long summer vacations, there would be bricklayers' work going on, in which they could very readily find employment at full current wages, and it is a poor place which is paying much less than $3 per day. He would be a poor student, too, who couldn't hold his own by the side of an average bricklayer, after his course, say, of six lessons, with three hours of careful and painstaking practice after each.

REFERRED TO OUR READERS.

Fruit Room.

From R. M., *Orangeville, Ont.*—I desire to learn, through the paper, some information concerning the best mode of building a cold room for storing fruit, vegetables or meat. It should be suitable for a retail dealer in these lines. If any of the readers of *Carpentry and Building* have ever built an article of this kind which has proven satisfactory in the way of preserving the ice and maintaining a low temperature, they will certainly be adding something of interest to the paper by sending forward an account for publication.

Method of Writing Feet and Inches.

From G. J., *Trenton, N. J.*—Two readers of the paper, G. C. and G. J., have been arguing about the proper method of writing feet and inches. G. J. maintains that the way taught in arithmetics under decimals, thus, 4 ft. 3′ for 4 feet and 3 inches, is correct. G. C., on the other hand, argues that 4′ 3″ is correct for 4 feet and 3 inches, because the architects are in the habit of writing it in that way. G. J. argues that the architects only use this method as in duodecimals, thus, $4' = {}^4/_{12}$ of a foot, $3'' = {}^3/_{144}$ of a foot. The dispute amounts to this, is G. C.'s way of writing feet and inches correct, or is G. J.'s the right method?

Note.—There has always appeared to us to be a discrepancy between the common practice in the method of writing feet and inches and that which would seem to be derived from the rule of duodecimals as laid down in the school arithmetics. The sign of prime (′) and the sign of double prime (″) are in almost universal use among architects and engineers to indicate feet and inches. Accordingly, the reader who has argued for the use of this method of writing, has in support of his position common usage. If our readers have anything to say upon this point, we shall be glad to hear from them.

Length of a Brace.

From G. L. M., *Kingston, Pa.*—Will some reader give a good, practical rule for getting the length of a brace on the free side of a post when the girt or stringer inclines at a given pitch?

STRAY CHIPS.

UNDER DATE of June 6, a correspondent in Cincinnati writes us with reference to the strikes in that city. He says: "The plasterers began work the first of the month, after being out nine weeks. They were successful in obtaining $3.50 a day. The carpenters were less successful in their effort, being compelled to return to their work at the old rate. Some offered to work for less after being out three weeks. The tinners and galvanized iron men were compelled, after being out two weeks, to resume their work without accomplishing their purpose. The latter men struck because the employers would not sign the scale. The carpenters struck for a raise of 50 cents and the scale. The scale was as follows: 1. Pay day to be on Saturday. 2. Time on Saturday to be only nine hours. 3. Night work and Sunday work to be paid at double rates. 4. A standing shop committee appointed by the unions, one for each branch, whose duty it should be to go around the workshops, fix upon the wages each man is to get, settle all disputes with regard to wages, and employers to abide by their decisions."

ONE OF THE largest and most costly buildings in this city has recently been finished for Messrs. Francis H. Leggett & Co., the wholesale grocers, from plans furnished by Mr Geo. W. de Cunha, architect, No. 111 Broadway, this city. The building is irregular in shape, covering an area of four lots bounded by Varick and Franklin streets and West Broadway. It is nine stories high, exclusive of the cellar. The cost of this building was $230,000, while the ground on which it stands is worth $100,000.

MR. THEODORE A. RICHTER, JR., of Cincinnati, has recently furnished drawings for three frame residences to be built in the suburbs of that city. The owners are Messrs. L. Heil, F. Tischbein and R. Hamilton. The estimated cost of these buildings is about $4000.

THE NEW BUILDING for St. Luke's Hospital at St. Louis (Episcopal) has been completed and is now in use. It is believed that this hospital is now equal to any of its size in the country for the completeness of its appointments and the excellence of its arrangements. Mr. George I. Barnett is the architect. The old hospital is being converted for manufacturing purposes.

MR. JAMES W. MCLAUGHLIN, architect, of Cincinnati, has finished drawings for the Academy of Music, which is an addition to the famous music hall of that city. The same architect is making sketches of an art museum to be erected in Eden Park, Cincinnati.

WILLIAMS COLLEGE, Massachusetts, is having an important addition made to it this year, in the shape of a stone dormitory building. It is four stories high, and will cost $100,000. Messrs. Cady & Co., of New York City, are the architects. A number of dwelling houses are also in progress at Williamstown.

ABOUT A YEAR ago the old Planters' House, at St. Louis, one of the oldest hotels in the city, was enlarged by adding two stories in hight and making extensive internal improvements. Recently it has been discovered that the old walls were hardly able to bear the additional weight thus placed upon them, portions of the brickwork in the lower stories scaling off, cracking and crushing. Strong anchors have been inserted in these walls, and the defective bricks are being replaced with new and stronger ones. Instances like this show that inferior work was occasionally done in the "good old times" as well as in these modern days.

THE NEW COLLEGE of the Christian Brothers, in the western suburbs of St. Louis, Mr. James McGrath, architect, is progressing favorably. The walls are two stories high already and the building will probably be under roof very soon. This is one of the largest institutions of its kind in the West.

THE STEWART down-town store, corner Broadway and Chambers street, this city, and which has been standing idle for a number of years, is now being altered into an office building. Elevators and a number of partition walls are the principal features of the change. Stores are to occupy the lower story. The alteration will probably occupy several months.

THE NEW SUMMER resort at Montesano Springs, 20 miles below St. Louis, just opened, promises to be a very popular institution. The Tally Ho Coaching Club makes daily trips thither, and excursions by river and rail are frequent. The papers pronounce the new hotel a model of good taste. Mr. Charles E. Illsley, of St. Louis, is the architect.

THERE ARE about 1000 sash, blind and door makers in this city. Representatives of the mechanics engaged in this line recently met for the purpose of forming a union.

THERE IS an excellent field at St. Louis for a good brick machine. The clay is of the best quality and abundant, and the market for bricks almost unlimited. There are several machines in operation and their capacity is being increased annually, but the demand grows so much faster that building operations are delayed every year seriously for want of brick, and the manufacturers dictate their own terms and prices.

A SYNDICATE of capitalists, with Mr. Wayman Crow at their head, has purchased a portion of the old Wesleyan Cemetery in the western suburbs of St. Louis, with the intention of laying out a park to be surrounded by residences of the best class. Property in this section of the city has doubled in value within three or four years.

MR. S. W. FOULK, of Greenville, Pa., has in progress a brick school building at Andover, Ohio, brick dwellings for Mr. F. C. Gibson and Mr. Samuel Porter, of Greenville, Pa., a frame dwelling for Mr. Charles Beechler, a storeroom for Mr. William Padem, together with other work of less importance.

BUILDING OPERATIONS in St. Louis this season are greatly retarded by the scarcity of bricks. While the leading brick manufacturers are increasing their facilities and their output every year, they fail to keep pace with the rapidly growing demand for their product. The hydraulic machine bricks of St. Louis are of superior quality, and command an extensive sale in other cities. Several millions have been sent to Chicago in a single year.

THE FIRST NATIONAL BANK of Clinton, Mass., has nearly completed its new building, costing about $50,000. The structure is of pressed brick with marble trimmings. Messrs. E. Boyeden & Son, of Worcester, were the architects, and Mr. H. G. Morse, of Fitchburg, the contractor.

HANNIBAL, MO., has an appropriation of $75,000 toward a post office building.

GOVERNMENT BUILDINGS, to cost $175,000, are soon to be erected at Quincy, Ill.

THE BOARD OF DIRECTORS of the National Mining and Industrial Exposition, Denver, Col., have awarded the contract of their building to E. F. Halleck, the price being $140,000.

MESSRS. LOGAN & STONE are building, at La Fontaine, Ind., a steam mill to cost $15,000, and to be completed September 1. The structure is of frame, three stories above the basement. The plan is 40 x 60 feet.

THE TOTAL building permits issued in Denver, Col., for the five months ending June 1, aggregated $1,217,137.

THE HARRISON STEEL COMPANY, of St. Louis, recently incorporated, is making preparations on a very extensive scale for the manufacture of steel by the basic process, now successfully employed in England. They have purchased 65 acres of ground convenient to coal mines and on the banks of the Mississippi River, and are having plans prepared for works to cost $3,000,000. The company is a strong one, and there can hardly be a doubt of their success.

THE TOTAL estimated value of buildings in this city for which permits were granted the first three months of the present year, was $10,932,600. This aggregate represents 924 new structures.

A NEW jail is in contemplation at Asheville, N. C.

THE GREAT PAINTERS' STRIKE in St. Louis has ended by the men agreeing to work on the best terms they can make, precisely as they did before the strike began. This strike has lasted nearly two months and has accomplished no material result except a good deal of ill will, the permanent loss of their situations by the ringleaders, and doubtless a largely increased expenditure at the saloons of earnings sorely needed by families at home

NOTWITHSTANDING the fact that upward of 150 new offices were erected last year in the lower part of New York city, the demand for eligible offices is still much greater than the supply. The rents for this class of property have been advanced from 10 to 15 per cent. over last year's prices.

IF A TWO-WHEELED vehicle is a bicycle, and a three-wheeled a tricycle, it does not follow that the one-wheeled is an icicle. It is a wheelbarrow.

THE IRON MOUNTAIN RAILWAY CO., of St. Louis, has procured ground at the corner of Chouteau avenue and 4th street, on which it will build a passenger depot for its local travel, which is large and increasing. The old depot at the foot of Plum street will be used for freight exclusively as soon as the new building is done.

NEW GLASS WORKS are being erected in the southern part of the city of St. Louis. The glass industry in this vicinity is prosperous and rapidly increasing. The plate-glass works at Crystal City, 30 miles below St. Louis, have more than doubled their capacity within a few years.

CARPENTRY AND BUILDING

A MONTHLY JOURNAL.

VOLUME IV. NEW YORK=AUGUST, 1882. NUMBER 8

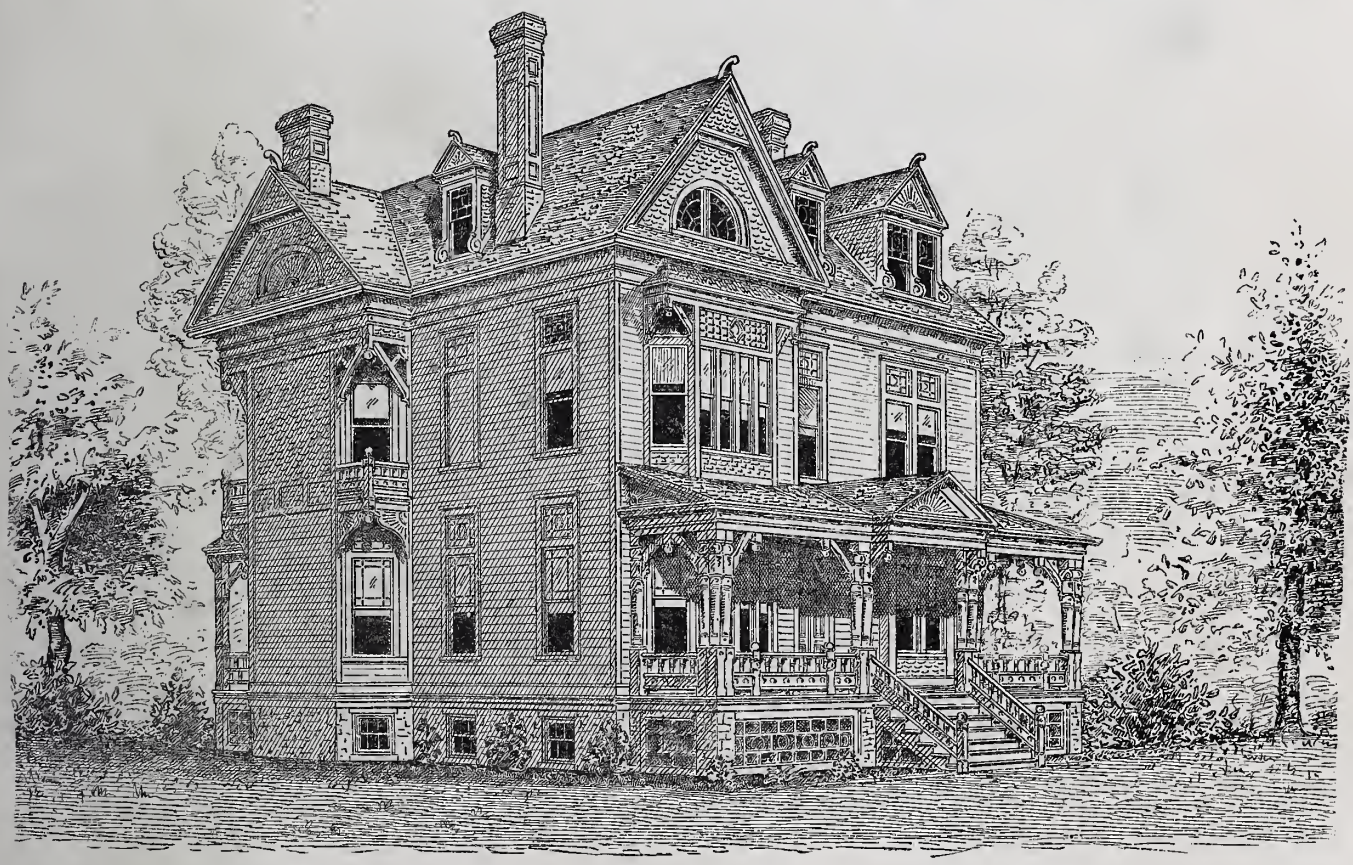
The Building Outlook.

In our account of the prospects in the building business published some months since, we called attention to the fact that the amount of building contemplated in this country this season was, probably, in excess of anything that had ever been accomplished before. We pointed out that there were several grave dangers that might be encountered, among which was the possible demands upon the part of mechanics and laborers for more wages than circumstances would permit builders and real estate operators to pay. In subsequent issues we noted the stoppage of several large operations, and letters from correspondents directing attention to local embarrasments of the building industry arising from some of the causes just mentioned. The season has so far advanced that it is possible in a measure to judge of the actual condition of the building business for the year. While the labor difficulties have been a great embarrassment in many sections of the country, the amount of building that has gone on has been much larger than might at first have been supposed. There are very few mechanics who are out of employment, and, for the most part, wages are satisfactory both to the employee and the employer. Building operations throughout the West seem destined to be very large during the remainder of the season. Many things have conspired to delay and hinder work throughout this section of the country during that portion of the season already past. An exchange, in commenting upon this subject, mentions among the reasons why work has not progressed more rapidly, the scarcity of labor and material occasioned by strikes, and the fickleness of the weather, which, in many regions, has been anything but favorable to the erection of buildings. Many who have been deterred by the high prices of labor and materials, have finally concluded that their interests would still be best served by pushing ahead with the building enterprises first contemplated. All the enterprising cities and towns of the West are characterized at the present time by intense building activity. In St. Paul, Minneapolis, and many other places in the West, there are in process of erection large buisiness blocks, numerous churches, extensive factories, public buildings and residences almost without number. The building permits issued in Chicago, St. Louis, Milwaukee and San Francisco, show that the period of prosperity has not, as many have supposed, temporarily ceased. The smaller interior towns, whose population range from 1000 to 10,000, are not behind the cities in the matter of building, speaking, of course, in comparative terms. Every issue of the local papers chronicles new enterprises, and the frequency with which building booms are announced causes one to wonder when the end to all this activity and outward evidence of wealth and prosperity will come.

In the early part of the season the results of the summer's crops were frequently referred to as being the key to the situation. Almost every commercial and financial article published in the metropolitan press made more or less reference to this fact. The cold, damp weather, and the almost unprecedented storms of the early part of summer, caused much discouragement. In the last few weeks, however, it would seem that the success of the growing crops has been assured. The daily papers publish accounts from all over the West and South showing that the corn crop, the wheat crop and the cotton crop are likely to be fully up to the average, if not considerably in excess, of the largest crops that have ever been harvested. The effect of such a season upon the farmers cannot fail to produce active business for the builders. It will not only be felt in what remains of the present season, but will also have its effect in the business of next year. A long look ahead from the present standpoint seems to promise continued prosperity in the building business.

Competition Design in Elevations and Details of the Eight Room House.

In giving account of the results of the sixth competition in our July issue, we mentioned that some of the best designs submitted were thrown out by the committee of award because the elevations did not conform to the given floor plans. It seems unwise to refrain from publishing some of the best designs received simply because omissions of insignificant parts have occurred, though such omissions were sufficient to throw the designs out of the competition. Accordingly we present herewith the designs submitted by Mr. T. F. Schneider, of Washington, D. C., the beauty and appropriateness of which, for the situation named, will be at once appreciated by our readers. By examination of the front and rear elevations it will be seen that the author has omitted in both instances all view of the side entrance communicating with the basement and kitchen. We believe it is a debatable point among architects whether parts of a house of so little importance as a feature of this kind and occuring midway between two extremes, are necessary to be shown upon elevations. In the estimation of



Competition Design in the Elevations and Details of the Eight-Room House.—Submitted by Mr. T. F. Schneider, Washington, D. C.

Elevations and Details of the Eight-Room House.—Fig. 2.—Front Elevation.—Scale, ⅛ Inch to the Foot.

the committee of award, however, this doubt was not sufficient to allow this design a place among those to which prizes were awarded. We allude to these facts now to show how near this author came to receiving a reward for his efforts.

In some features the design here submitted resembles that published in our July number. There is a remarkable similarity in the balconies that are worked in the sides of the bay window. However, this is simply a coincidence and shows the appropriateness of such a feature in the place designated In the arrangement of the attic plan the several rooms employed have been arranged for living rooms. The author remarks in the explanation furnished with his plans, that of course they need not be finished as such, but the general construction indicated should remain. We commend this design to the attention of our readers as one of the most happy combinations of those features of architecture which are at present very popular, with the accepted demands of the day for light, airy and commodious houses. The old styles of architecture that are being revived and which are at present so popular, in the hands of many designers become mere servile imitations of the buildings of Colonial times, and the structures built to them lose much of the attractiveness of modern houses. In the past 20 years our people have become accustomed to high ceilings, large windows, in short, plenty of light and ventilation. Whatever may be said upon the score of fashion and the fact that new styles are in demand, it still remains that a Queen Anne house is somewhat forbidding in aspect on account of its low appearance and the sense of cramped apartments incident to the style of architecture em-

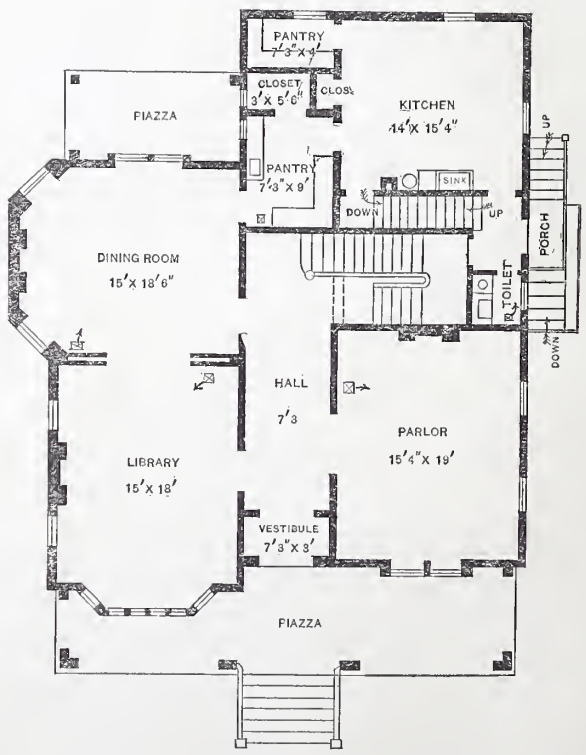
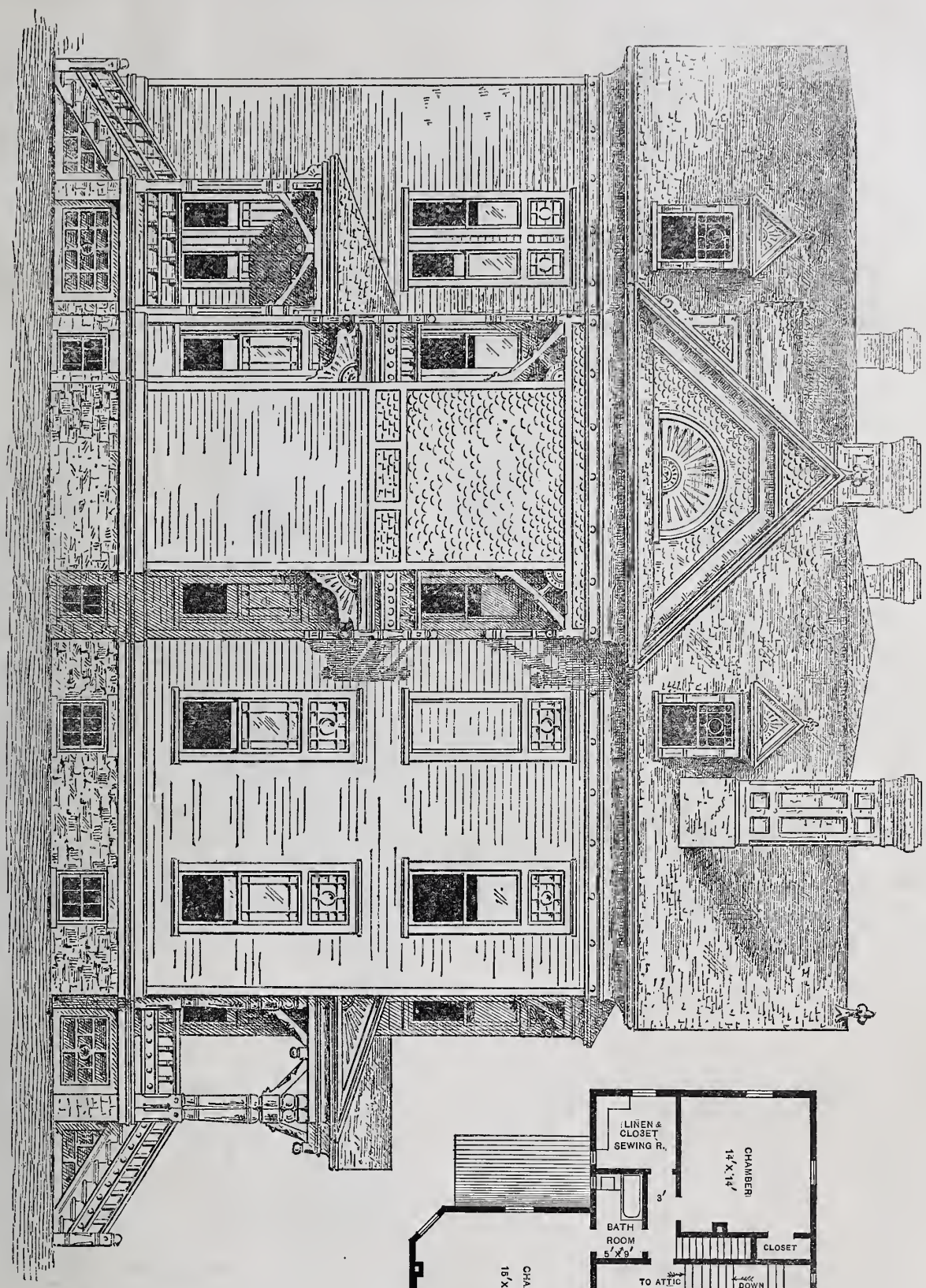


Fig. 3.—First Floor Plan.—Scale, 1-16 Inch to the Foot.

Elevations and Details of the Eight-Room House.—Fig. 4.—Side Elevation.—Scale, ⅛ Inch to the Foot.



ployed. While there may be an abundance of crooks and crannies about the house and many romantic combinations, it always seems that modern convenience and comfort have been sacrificed for the sake of these old-time features. The present design maintains many of the features that render these styles of architecture so popular, without sacrificing any of those conveniences to which the public have become wedded.

We have in Mr. Schneider's design a building that stands well above the ground, has high stories, an abundance of light and ventilation, the convenience and effect of a mansard story without actual mansard form, and details that are in what is at present a popular style of architecture. As remarked at the outset, we regard it as one of the happiest combinations of the elements employed that we have seen in a long time. The same features applied to a little different floor plan would, possibly, have produced a still happier effect.

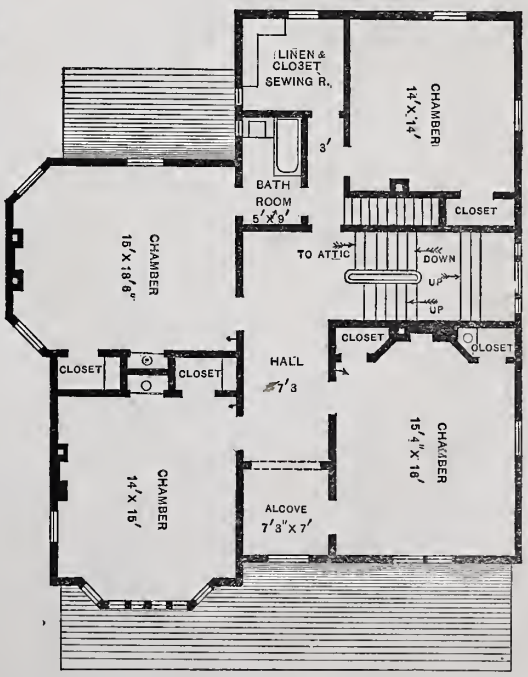


Fig. 5.—Second Floor Plan.—Scale, 1-16 Inch to the Foot.

Fig. 6.—Rear Elevation.—Scale, ⅛ Inch to the Foot.

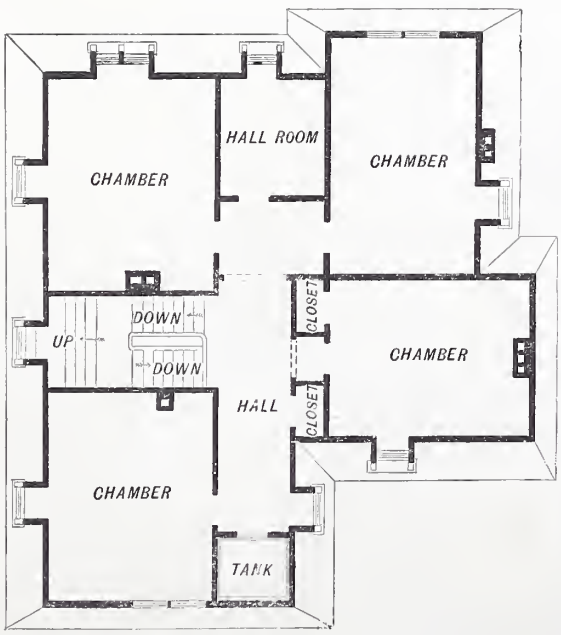


Fig. 7.—Attic Plan.—Scale, 1-16 Inch to the Foot.

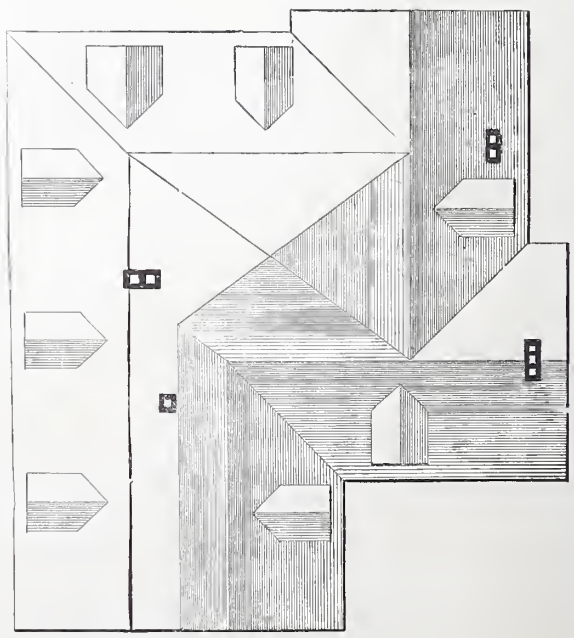


Fig. 8.—Roof Plan.—Scale, 1-16 Inch to the Foot.

ELEVATIONS AND DETAILS OF THE EIGHT ROOM HOUSE.

Present Styles of House Painting.

A recent number of the *Painter's Magazine* gives attention to the present styles of house painting, and makes some remarks which will bear repetition in this connection. It is in the suburbs of cities that we see the results of improvement in the art of outside painting and decoration. Of late numerous changes which have been going on in this department of the trade have been noticeable. One thing attracts attention in whatever direction we look, and that is the poverty of resource for introducing variety and adaptiveness to the surroundings and style of architecture. A painter of taste and culture paints a handsome residence in some locality in a becoming and elegant style. For a year or more every new building, and the repainting of old ones in that neighborhood, will be in the same general style. Little heed is paid to variations of architecture or surroundings. If any mistakes were made in the original, they are sure to be copied. If the model house is painted with medium body tint and light trimmings, the others will follow suit. There may be a little variation in the depth or lightness of the shade, but the general style will be copied. In some localities reddish brown shades have become popular, in place of the old-time green blinds. These reddish blinds will follow, no matter what the body color of the house may be. So, again, in some localities the stylish house of

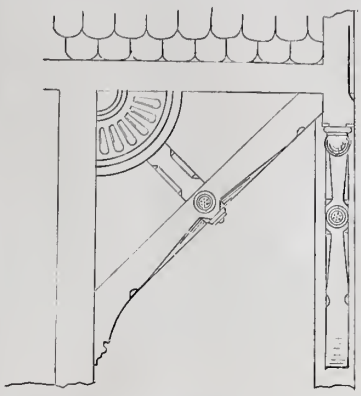


Fig. 10.—*Detail of Finish Over Balconies on Bay Window.—Scale, ⅜ Inch to the Foot.*

some prominent resident is painted with very light body color and dark trimmings. Immediately all the houses in that neighborhood follow suit without rhyme or reason to justify the imitation. Now and then we see a case of revolt against this tame imitation. Some one breaks loose and paints his house a deep red with dark olive green blinds and trimmings. This is the usual excess of reaction against any existing error. Extreme conservatism begets extreme changes under the name of reform.

Long Branch contains some of the best painted houses in the neighborhood of New York, and they have attracted attention upon the part of visitors who have been to that famous locality. The question is sometimes raised as to what colors are employed. The *Painter's Magazine*, in answering this

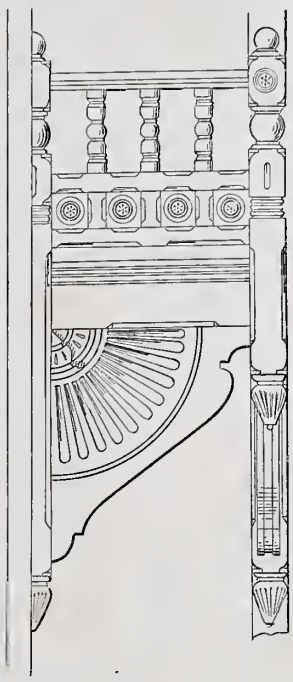
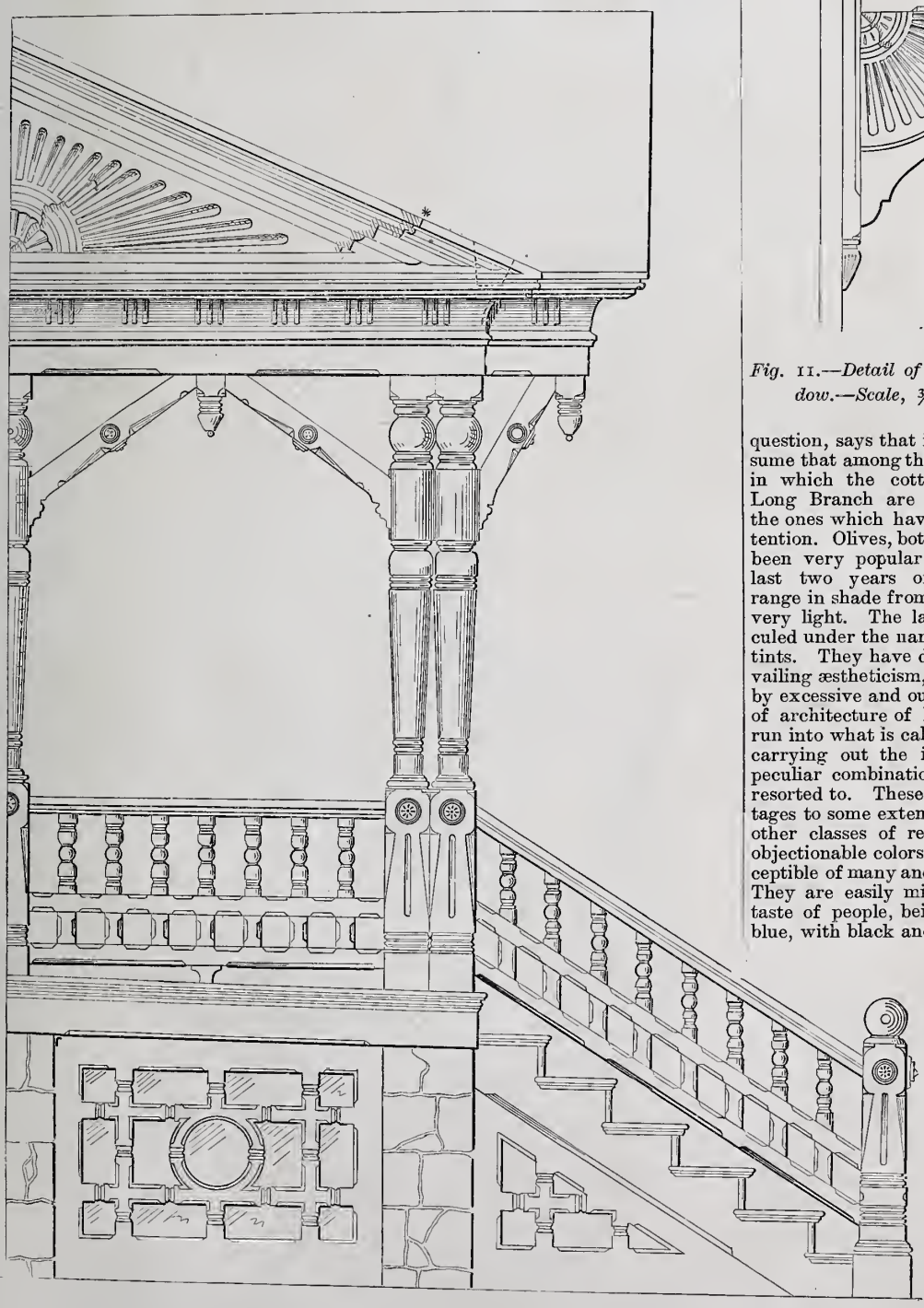


Fig. 11.—*Detail of Balconies on Bay Window.—Scale, ⅜ Inch to the Foot.*

question, says that it is probably safe to assume that among the various tints and shades in which the cottages and residences of Long Branch are painted, the olives are the ones which have attracted the most attention. Olives, both drabs and greens, have been very popular in this locality for the last two years or more. These greens range in shade from dark to almost black to very light. The latter are sometimes ridiculed under the name of "yallery greenery" tints. They have done the work of the prevailing æstheticism, and have been run down by excessive and outlandish use. The style of architecture of Long Branch has latterly run into what is called the Queen Anne. In carrying out the ideas of this style very peculiar combinations of colors have been resorted to. These olives are found on cottages to some extent, but more, perhaps, on other classes of residences. They are not objectionable colors themselves, and are susceptible of many and becoming combinations. They are easily mixed to suit the varying taste of people, being composed of yellow, blue, with black and white to vary the shade according to desire. However, they have had their day as greens, and we learn from the manufacturers that the demand for them has greatly fallen off. The olive drabs are still in use, and are popular.



Elevations and Details of the Eight-Room House.—Fig. 9.—*Details of Porch.—Scale, ⅜ Inch to the Foot.*

A 2-foot rule was given to a laborer in a Clyde boat yard to measure an iron plate. The laborer not being well up to the use of the rule, after spending a considerable time, returned. "Noo Mick," asked the

plater, "what size is the plate?" "Well," replied Mick, with a grin of satisfaction, "its the length of your rule and two thumbs over, with this piece of brick and the breadth of my hand and my arm from here to there, bar a finger."

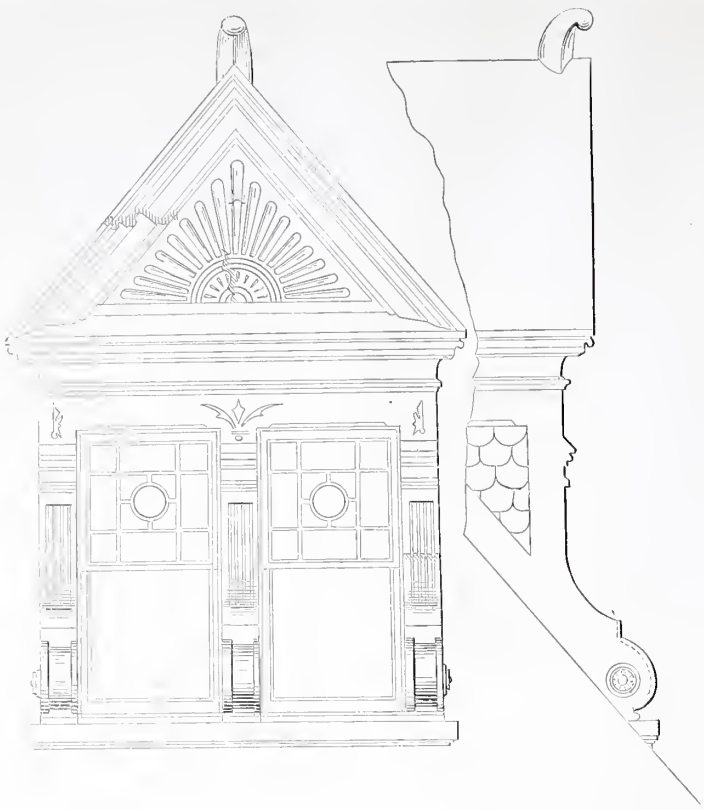


Fig. 12.—Dormer Window.—Scale, ⅜ Inch to the Foot.

Valuable Decorative Process.

The staining of white woods in various patterns, in imitation of inlaid woods, is a subject to which some attention has been paid by an English firm, and the following process, as proposed by them, will not be without interest: The surface to be decorated is made as smooth as possible, and is then covered with one or two coatings of size, prepared by adding to glue size of just sufficient strength to form a jelly, a little egg albumen and a small quantity of alum. When this is dry and thoroughly hard, the design must be traced or pounced upon it. The outline and those lines separating the different parts of the design, and all other parts that are to remain the natural color of the wood, are then carefully painted in with Brunswick black or Canada balsam, laying on the black with a good body. This should remain until it gets thoroughly hard, which will be in about six or seven hours. The surface is then washed with a sponge and lukewarm water until all the size is removed from the exposed parts, the pattern drawn in the Brunswick black, which is impervious to water, remaining intact, and serving to prevent the stains running together when being applied. This washing must thoroughly remove all the size preparation, and after the wood has been allowed to dry it will be ready for the application of the colored stains. If the painting has been properly done, the design will appear as a clear black outline, the white spaces in which are to be filled in with various colors, after which the black outline is to be removed, as will be explained. The black lines should be fully a sixteenth of an inch wide, and wider if required. Having decided upon the woods to be imitated, and the colors to be used, the stains, which may be either spirit stains or water stains, or both, may be laid in. The lightest stains must be put in first, and need not be confined to the exact outline of that particular part, but it is as well that they should be. The stain may be freely used and laid as level as it will allow, but a little shadiness is not at all objectionable. The next darkest stain may now be proceeded with, and so on for as many stains as are desired. When all are dry and hard the black outline may be washed clean off the wood with a brush and turpentine, which may be used freely until the whole of the Brunswick black is removed. The various colored stains will then appear inclosed in a white outline, which, if properly done, will be sharp and clean and clear as an inlay of the real woods. What grain the white wood has will be more or less seen through the stains as they may be light or dark.

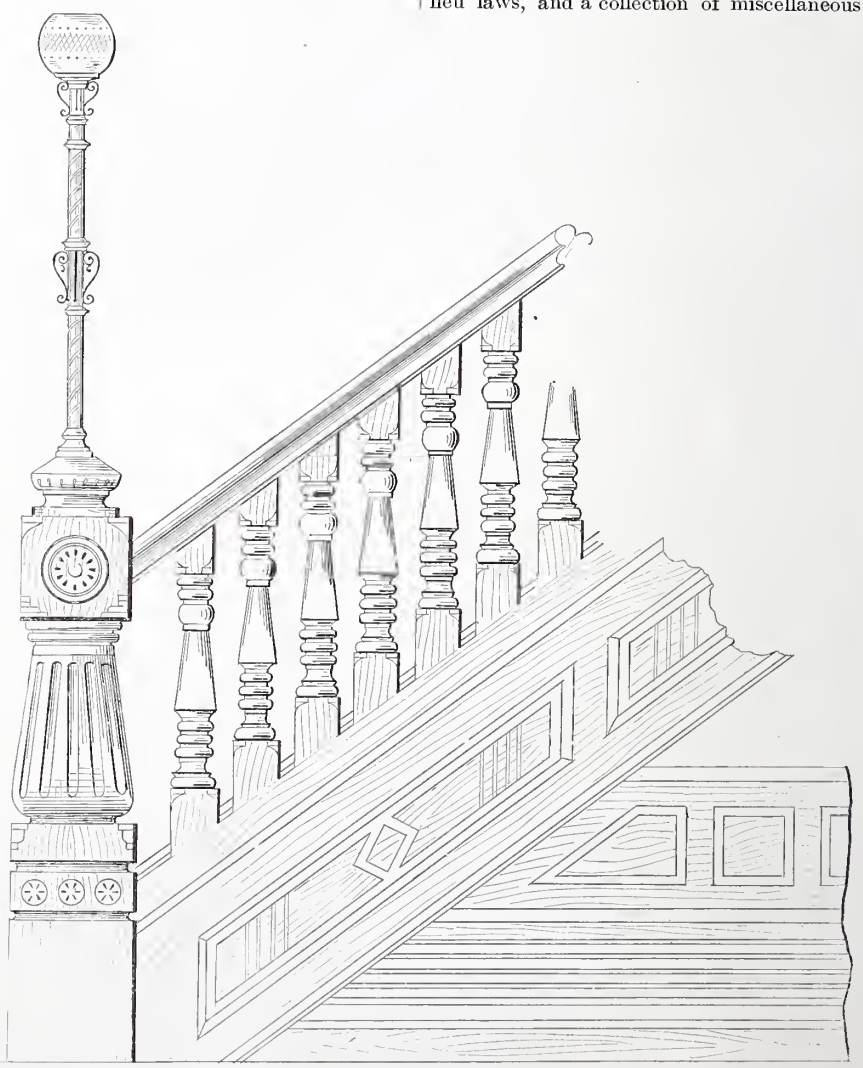


Fig. 13.—Main Stairs and Wainscot in Front Hall.—Scale, ¾ Inch to the Foot.

NEW PUBLICATIONS.

THE LUMBERMAN'S HAND-BOOK By W. B. Judson, Editor *Northwestern Lumberman*. 190 pages; 4 by 5 inches; with illustrations. Price, $1.25.

This is a new and enlarged edition, to which have been added illustrations of a well-known hand-book, prepared by the editor of the *Northwestern Lumberman*, for use among lumber dealers, lumber manufacturers, builders, and others. The first topic treated is "Lumber Inspection." After giving the subject general consideration, the special feaures of Albany Inspection, Saginaw Inspection, Chicago Cargo Inspection, Chicago Yard Grading, Chicago Hard Wood Inspection, St. Louis Inspection, and notes upon inspection in various other portions of the country, are presented. This is a most valuable feature of the work, and in the hands of builders will be useful in giving them definite information as to what constitutes lumber of specified grades and qualities. The second subject treated is log measurements, which is illustrated by diagrams and supplemented by tables and rules. Shingle manufacture then receives brief attention, following which is a chapter on Rural Architecture, in which are presented a number of designs of inexpensive houses, with floor plans and specifications of material required. Hints to builders, with engravings illustrating features of construction, and notes upon strength of materials, heat and ventilation, follow. A retailer's ready reckoner is the next subject to which attention is given. Planing mill machinery, its selection, arrangement, and care, is the next topic discussed, among the illustrations of which will be found the plans of a model planing mill. Mechanics' lien laws, and a collection of miscellaneous information, useful to builders and lumber dealers, complete the book. This little work is of value to every intelligent builder, and is deserving of large circulation.

ARTISTIC HOMES IN CITY AND COUNTRY. By Albert W. Fuller, Architect. Oblong 9 by 15 inches. 44 full-page illustrations with brief explanatory text. Published by James R. Osgood & Co. Price, $3.50.

The reputation of Mr. Fuller as an architect would in itself be sufficient to give this work a wide circulation. Its intrinsic merits, however, will no doubt bring it to the attention of many who would otherwise never have heard of its author. The plates presented are the result of the general routine of his work during two years previous to the publication of the volume. The sketches from which the engravings were made are such as have been actually prepared for parties contemplating the erection of homes, and therefore possess a practical interest which mere studies for the sake of publication fail to show. The selection, as indicated by the title of the book, embraces houses adapted for both city and country. The drawings, for the most part, consist of perspective views of floor plans to scale and perspective details of interior finish and decoration. While the work has been intended more especially for architects and designers, it contains much that is of practical interest to the builder. Plate 12, entitled "The Old made New," is an example of what may be done in a house already erected that will be of interest to many people. A chapter on drainage and plumbing, which is incorporated in the book, will be of value to those who have not already given the subject of sanitary science careful attention. The work closes with drawings of a country church, such as would be suitable for erection in any well-to-do rural community. The materials of which it is built are brick and stone, and the estimated cost is about $10,000.

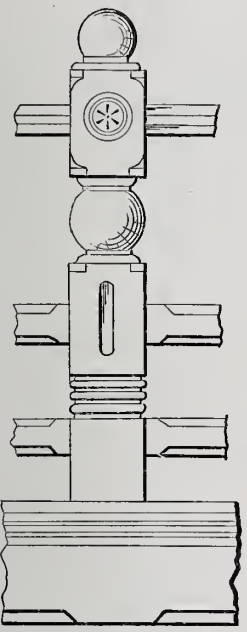


Fig. 14.—Detail of Post in Baulstrade of Porch.—Scale, ¾ Inch to the Foot.

HOUSE DRAINAGE AND SANITARY PLUMBING. By William Paul Gerhard, Civil and Sanitary Engineer, Newport, R. I. Pamphlet reprinted from the Fourth Annual Report of the State Board of Health of Rhode Island. 1882.

In this report the author has given very careful attention to all those problems connected with house draining and sanitary plumbing which are of interest to builders and house owners. He opens the subject by a very comprehensive and straightforward dissertation upon sewer gas, and then proceeds at once to a consideration of practical plumbing in connection with building. Drains Outside of the House, Drains Inside of the House, Soil and Waste Pipes, Fresh Air Inlets, Trapping Fixtures, Flushing Appliances, Ventilation of Traps, Plumbing Regulations, Plumbing Fixtures, Cisterns, &c., are some of the chapter heads contained in this book. Taken all in all, it is one of the most comprehensive and practical treatises on plumbing that has recently been put out, and as such should have wide circulation. Were we disposed to be critical, there is but one point upon which we should differ from the author, which is the introduction of a trap in the main soil pipe between the house and the sewer. From practical experience we are disposed to favor the use of soil pipes without traps, leaving the pipe entirely open, for purposes of ventilation, from the sewer to the outlet above the top of the house. The objections which may be urged against the use of traps in the main drain are, that they impede the ventilation of the public sewers, that they form an obstruction to the flow of the sewage in the house drain, and therefore cause accumulations of foul matter in the drain, which by decomposition generates noxious gases, and that foul matters are lodged in the trap. We think these objections more than offset the supposed advantages from the other form of construction. With this exception we quite coincide with the author's views.

House painters are beginning to develop high art. A Highland District man who wanted his house repainted, called upon one of the craft. "Well," said the painter, "what's your taste? I can give you a harmony in green and white, or a symphony in lavender and brown, or a nocturne in yellow and blue." And the householder was terribly embarrassed at being obliged to say he didn't know. He hadn't before been aware that it required a knowledge of high art to qualify a man to make a trade with his house painter.

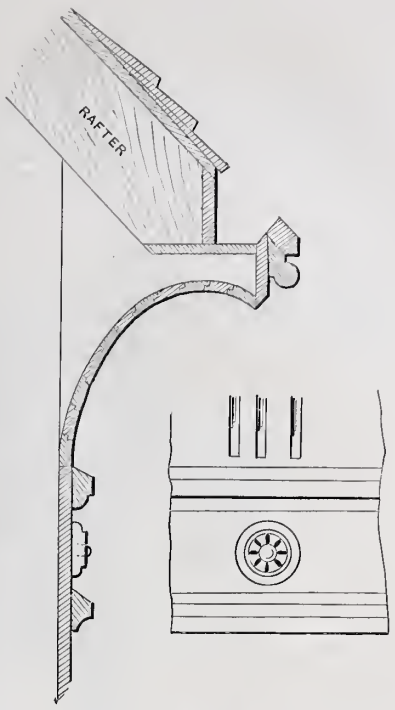
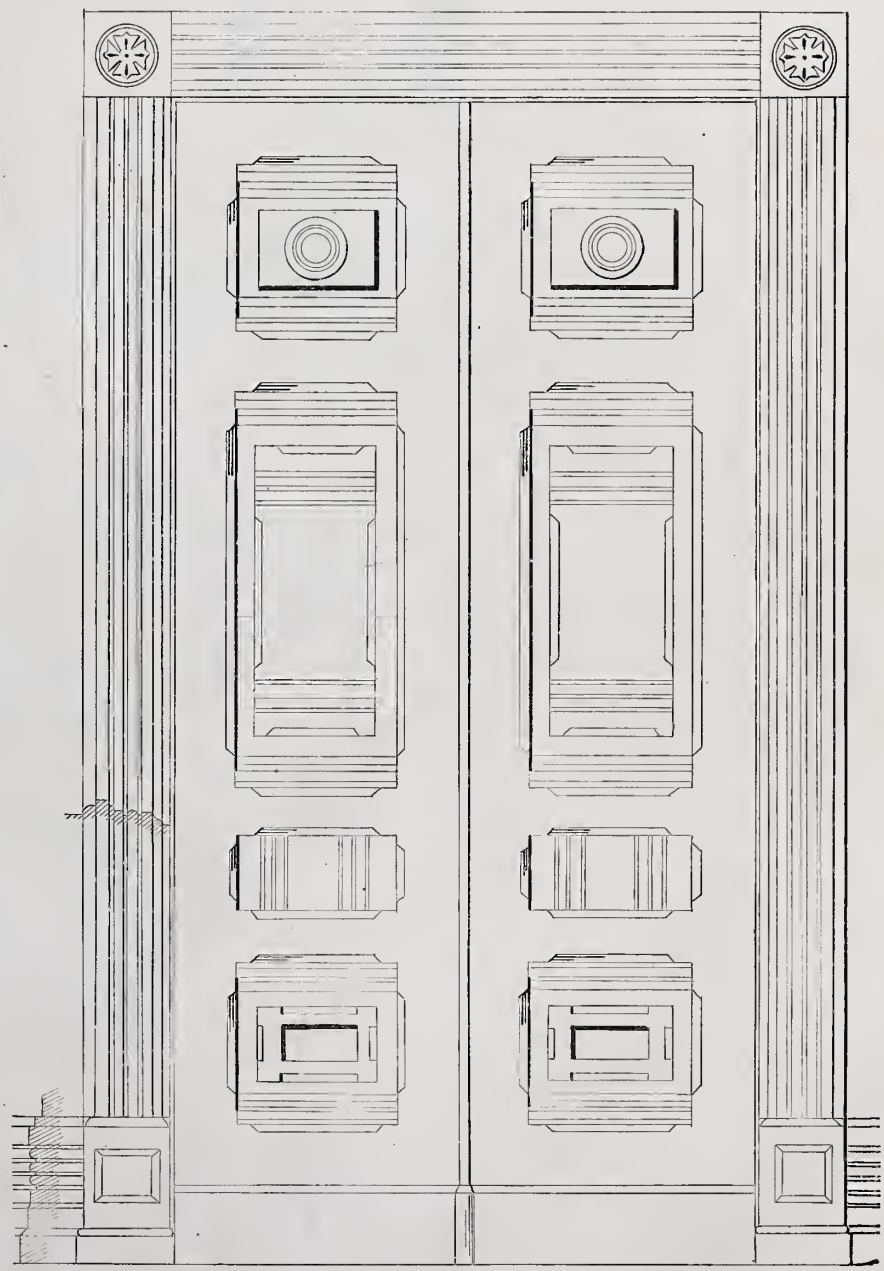


Fig. 15.—Detail of Main Cornice.—Scale, ¾ Inch to the Foot.

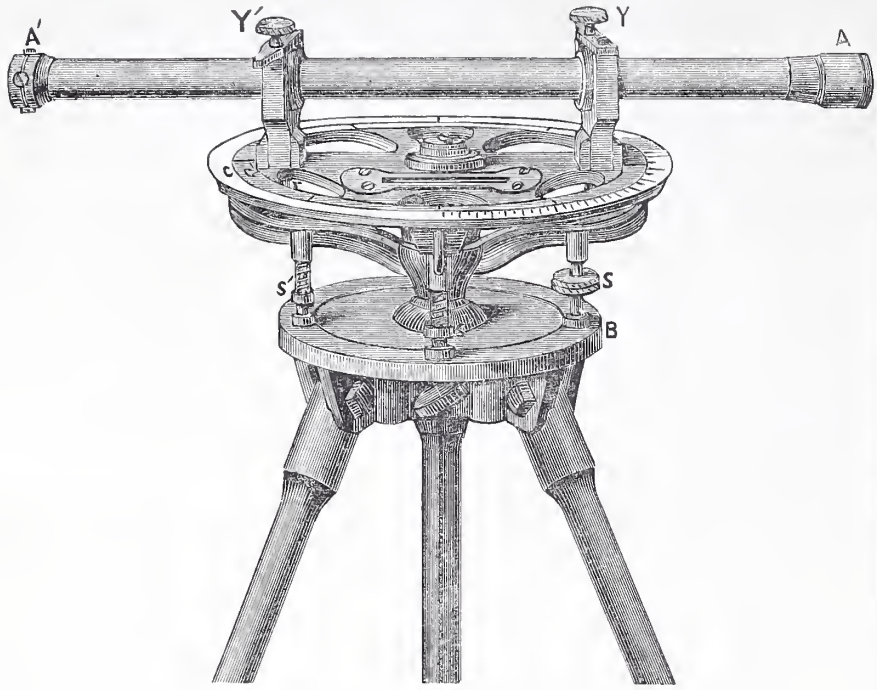


Elevations and Details of the Eight-Room House.—Fig. 16.—Detail of Door.—Scale, ¾ Inch to the Foot.

NOVELTIES.

THE COMSTOCK LEVEL.

An improved leveling instrument, a cut of which appears in Fig. 1 of the accompanying engravings, has recently been put on the market by Mr. W. T. Comstock, the well-known



Novelties.—Fig. 1.—The Comstock Level.

publisher of architectural works. This instrument is made of brass, lacquered so that it will not corrode, and has been planned especially for the use of architects, engineers, masons and builders. It consists of three principal parts, the sighting tube A A^1, the horizontal circles C and C^1, and the lower disk or base B. The sighting tube is 14 inches long, and has at the end A a pin-hole by which the operator may look through the tube. The end A^1 is provided with a small ring inside of the tube, holding cross-wires. These wires are adjusted to the center by small screws whose heads appear in the cut. The tube of the instrument rests in supports known as Y's, and they in turn are supported by the inner circle C^1. The tops of these supports Y and Y^2 are made in the shape of latches, by loosening which the sighting tube of the instrument may be revolved. The horizontal adjustment of the tube is provided by screws marked in the cut, which are operated by a key furnished with the instrument, by which the end of the tube may be raised or lowered as required in adjustment. The horizontal circles C and C^1 are concentric and revolve one inside of the other. The outer circle is graduated to degrees, and the inner circle marked at every 45 degrees, so that the instrument may be used in laying off angles, squaring foundations, &c. The circle C^1 carries a glass bulb by which the horizontal adjustment of the instrument is determined. The base B is simply a solid disk with a smoothly turned outer rim, on which little cups holding the feet of the screws and springs rest. The connection between the upper part of the instrument and the base B, is by means of screws S and S^1, and a ball and socket joint in the center, as shown in the cut. The centers, screw and shank of the ball are hollow, so that a cord suspending a plumb bob may be passed up through the instrument. The three adjustments required in leveling instruments to adapt them to accurate work are readily performed in this one, although by a little different means than is usual in more expensive articles. As stated in the beginning of this notice, this instrument has been devised specially to meet the wants of builders, and its parts and means of adjustment have been specially considered from this point of view.

ENCAUSTIC TILES.

The Star Encaustic Tile Co., Limited, of Pittsburgh, is the name of a new company which has succeeded to the business of the Pittsburgh Encaustic Tile Company. The new organization will continue the manufacture of plain and encaustic tiles at their works corner of Gist and Bluff streets, Pittsburgh. Increased facilities for the prosecution of business have been provided. The beauty and durability of tile floors, hearths, vestibules, &c., are universally acknowledged. The increasing demand for goods in this line, in both Eastern and Western cities, is sufficient evidence that they are rapidly taking the place of the clumsy marble and stone slabs so long in use. The enterprise of American manufacturers is fast supplying the demand in this country that has heretofore been filled by imported goods, so this company claims. It has been proven by experience and careful tests that the clays used in the tile made by this company are fully equal, and in some respects superior, to those used in much of the foreign goods brought to this market. This company advertises that estimates will be furnished on application, and that work will be put down on short notice by competent men whenever required. The many advantages attending the use of this kind of work for floors renders it very desirable, and builders are always interested in knowing where they can get their orders filled promptly.

GREENLEE'S SELF-FEEDING SAW-TABLE.

Fig. 2 of the engravings represents a self-feeding rip-saw table, manufactured by Messrs. Greenlee Bros. & Co., of 229, 231 West Twelfth street, Chicago. The manufacturers offer it as one of the best machines made for the purpose, and say that they can safely assert that it will save its cost in a very short time over the old method of ripping lumber. It is guaranteed to do the work of two or three common saw-tables with much less labor. The general arrangement of parts by which these advantages are gained are very clearly shown in the engraving. This device takes the place of the common rip-saw table, doing all kinds of ripping in planing mills, sash and door factories, furniture factories and the like It has a strong feed. The mark made by the feed is taken out with the saw, a feature which makes it desirable for planed lumber. Three different feeds are provided. The saw is fully protected by a shield, so that there is no chance for the operator to cut his fingers or for pieces to fly back. The table is so constructed that the feed can be raised up out of the way, and when in this shape it can be used as a common table. The frame is made of iron, with hard wood top, glued together in strips. The arbor is made of 1½-inch steel, and runs in self-oiling boxes with long bearings.

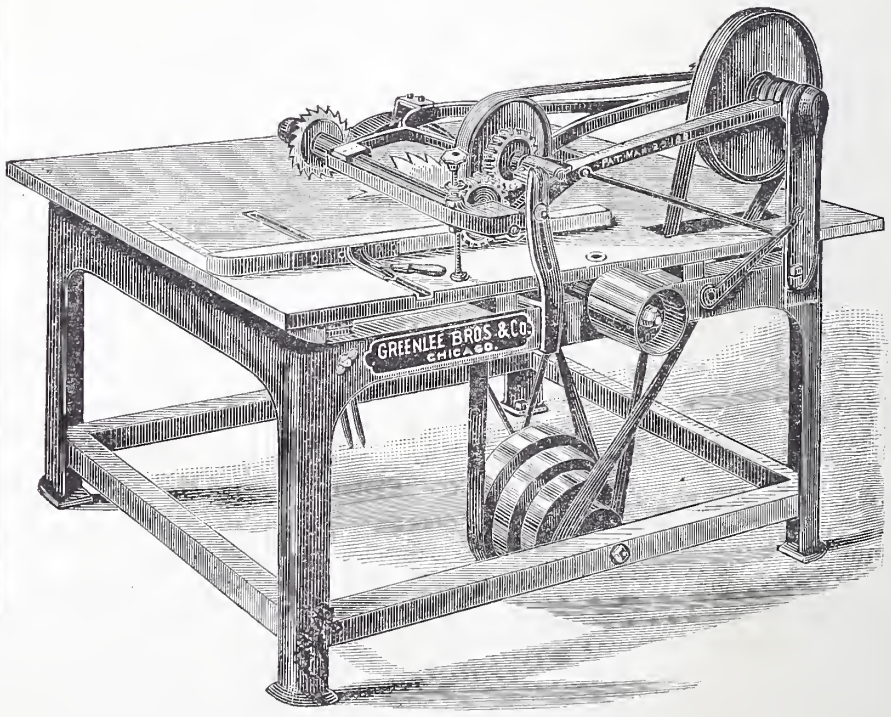


Fig. 2.—Greenlee Bros. & Co.'s New Saw Table.

COUNTERSINKING WOOD SCREWS.

A new and ingenious improvement in wood screws has recently been invented and patented by Mr. James W. Campbell, of Toledo, Ohio. The principal object of the invention is to provide a wood screw constructed so as to cut its own countersink, without materially increasing its cost. To this end the conical head of the screw is provided with a nick, shown in the accompanying engraving, the sides of which make an angle with each other, in order to give clearance to the chips made by a cutting edge at the extremity of one side. In the annexed cuts the lower one represents an elevation of the head and upper portion of the

improved screw, while the upper one represents a top view, both figures being drawn upon an enlarged scale, in order to clearly illustrate the invention. Similar letters of

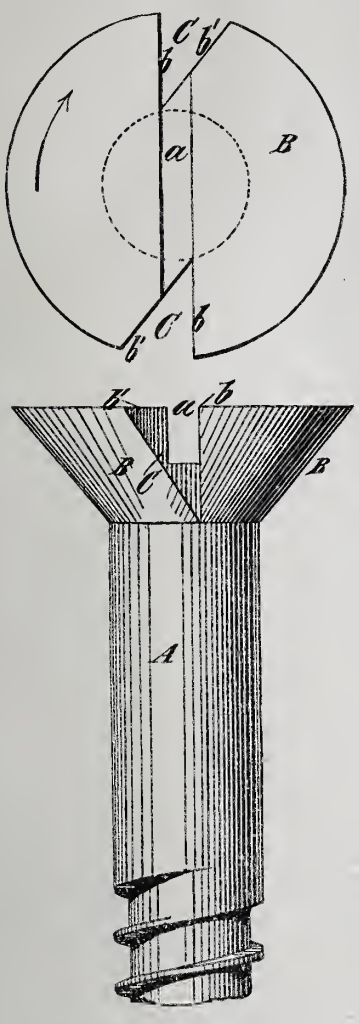


Fig. 3.—Campbell's Improvement in the Heads of Wood Screws.

reference designate corresponding parts in the figures. The body of the screw is designated by A, and the conical head B is provided with a nick, *a*, into which a screw-driver may be readily inserted. The two sides or walls of the nick *a* are parallel throughout the greater part of their length, but diverge from each other at each end of the nick, the extremity of the straight side *b* forming a cutting edge, and the oblique side b^1 giving clearance to the chips produced. The head B is provided with two notches, C, which are diametrically opposite each other at opposite ends of the nick, and the sides of which form continuations of the side *b* and b^1 of the nick, as is clearly shown in the cut. The screw when entering a piece of wood is, of course, turned in the direction of the arrow, and the cutting edge of each wall, *b*, forms the countersink. The notches C may be very readily formed by two milling saws of proper transverse sectional form, moving in a direction parallel with the longitudinal axis of the screw, and operating in conjunction with the nicking saw, and when so formed the notches add very little to the cost of the screws, and since only two notches are formed in the head, its bearing surface is but slightly impaired. The most important feature of the invention, probably, consists in the facility with which the notches above mentioned can be cut, as compared with notches otherwise formed. The improvement here described will not fail to be appreciated by those interested in the subject. Builders who desire can test the merits of this invention by filing notches in common screws.

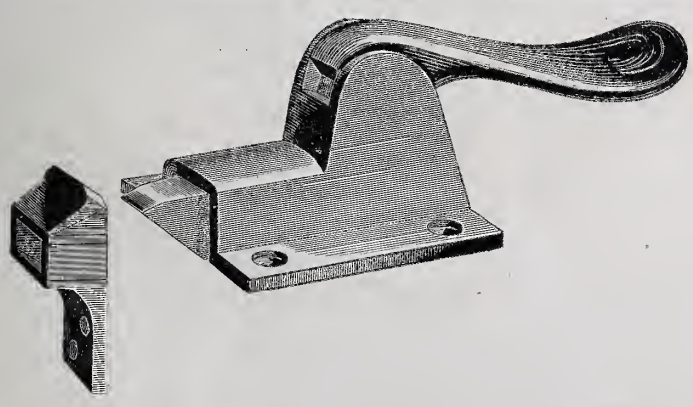


Fig. 4.—Improved Latch for Refrigerators and Ice Boxes.

REFRIGERATOR LATCH.

The Payson Manufacturing Company, 1319–1325 West Jackson street, Chicago, are making a latch for refrigerators which possesses some features that recommend it for use. We present an engraving of it in Fig. 4. It may be described as a simple, self-acting surface latch, provided with a bevel bolt and strike which serve to wedge the door tightly in place when closed so as to exclude the air. A scroll lever handle projects horizontally from the rear of the latch-box and is pivoted directly to the bolt. A pull outward upon the handle opens the door, and in closing a pressure upon the handle wedges it. By this means it is possible to shut the door very much more closely than is accomplished by latches of ordinary construction.

HENDRY'S IMPROVED VISE.

The vise illustrated in Figs. 5 and 6 of the engravings is especially designed for wood-

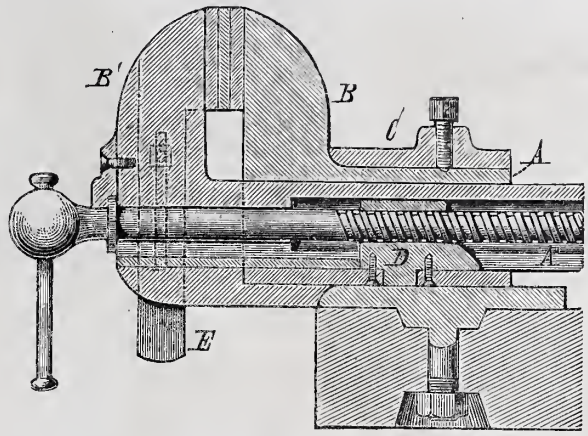


Fig. 5.—Hendry's Improved Vise.—View Showing the Vise as Used Under the Bench.

workers, and is considered quite convenient for pattern makers. It is capable of being arranged above the bench, at its side or underneath. The vise has an outer cylinder, A, cast

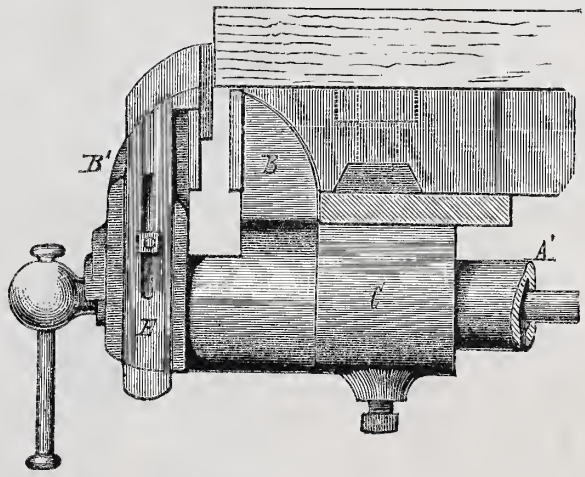


Fig. 6.—View of the Same Vise as Used Above the Bench.

with the inner jaw B, and an inner concentric tube, A^1, cast with the outer jaw B^1. The outer cylinder is received by a collar, *c*, cast with securing base and bolt for the attachment of the vise to the bench. By this construction the vise may be revolved in the collar or the collar upon the outer cylinder to permit of reversing its point of attachment to the under side of the bench. In Fig. 5 the vise is shown arranged above the bench, while in Fig. 6 it is shown under the bench. A screw is connected to the inner tube A^1 so as to revolve independently and effect its movement back and forth. This screw is received by a tubular nut, D, in the tube A^1. To the sides of the movable jaw B^1 there are applied adjustable plates, E, having slots and adjusting screws. These plates have affixed to their front edges a cross-piece or face connecting the two plates together on the inside of the jaw. By reversing the attachment of the vise to the under side of the bench, as shown in the second engraving, the face of the device E can be presented toward the end of the bench and be adjusted so as to stand above the bench and hold one end of a board to be planed or otherwise operated upon, thus making the vise serve the ordinary purpose of a carpenter's bench vise. The jaws in the first figure are shown provided with removable wooden faces which prevent their marring planed work when held between them. This vise is manufactured by Mr. Alexander Hendry, Fayetteville, Ark., and embodies features suggested in his own experience. In the estimation of numerous practical workers who have experimented with this vise, it is quite convenient and very desirable for general use.

AUTOMATIC FREIGHT ELEVATOR.

The Tewksbury Automatic Elevator Co., with office at No. 60 Temple Court, Beekman street, New York City, are furnishing an automatic freight elevator that possesses, some peculiar features, a brief description of which will undoubtedly be of interest. The elevator is designed for freight and package service in any locality, and is adapted for use wherever an elevator or dumb waiter can be employed. Its construction is such that the elevator can be dispatched from one floor to another and automatically stopped at its destination, without the necessity of any one accompanying it or being upon the floor for which it is intended. Another peculiarity of the device is that it plainly announces its arrival at the floor to which it has been dispatched. The hoisting and lowering mechanism does not differ essentially from that of a first-class passenger elevator. The motion is obtained by means of a steel worm or tangent screw, which gives motion through a worm wheel shipping the belt, while at the same time it is left free to be revolved. The rod J is provided with two collars, one near each end, in positions to positively stop the car by the operation of a stop in the car coming in contact with either of them, and thus shifting the belt by moving the rod up or down. These two collars correspond to the extreme upper and lower floors. To provide for automatically stopping the car at the intermediate floors, tappets, M, corresponding in number to the number of floors, are attached to the rod, each tappet occupying a position vertically corresponding to a floor, and all radiating in different directions. The stop on the cage passes all these tappets, except when they are revolved by means of a shaft, J, so as to intercept it. By this means it is possible for the person dispatching the car, by simply moving the rod J, to stop it at any floor required. The means of accomplishing this are clearly shown in the engraving. A pinion, I, is attached to the rod, as shown, into which is geared a segment, H, operated by a lever, B, pinioned at G. An index plate on the face of the segment, as indicated in the engraving at the right, shows the points to which this lever must be turned in order to stop the elevator at different floors. The system of levers shown in the engraving and in the index plate are provided on each floor, so that it makes it possible to operate the elevator from any given point and to stop it wherever required. To assist in stopping the car in the exact position required, the shipping-rod operates a toggle-joint lever, which, by means of a cross-head, is attached to one end of a friction-strap that embraces a friction wheel on the worm-shaft. By this means, when in the operation of shipping, the belts are shifted to the loose pulley, a powerful friction is brought to bear which instantly stops the car against any momentum it may have acquired. For the purpose of guiding the car in its ascent and descent, instead of the usual iron guides screwed to wooden posts or uprights, the company manufacturing this elevator uses guides made entirely of wrought iron, which, being independent of other parts of the structure, will always retain their original adjustment. The car is guided by grooved wheels, which are turned to fit the angle and are held in contact at all times by means of springs, thus providing for any inequality of distance between the guides that may occur, and keeping the car at all times accurately guided by means of a comparatively frictionless rolling machine. Careful attention has been given to construction in all particulars.

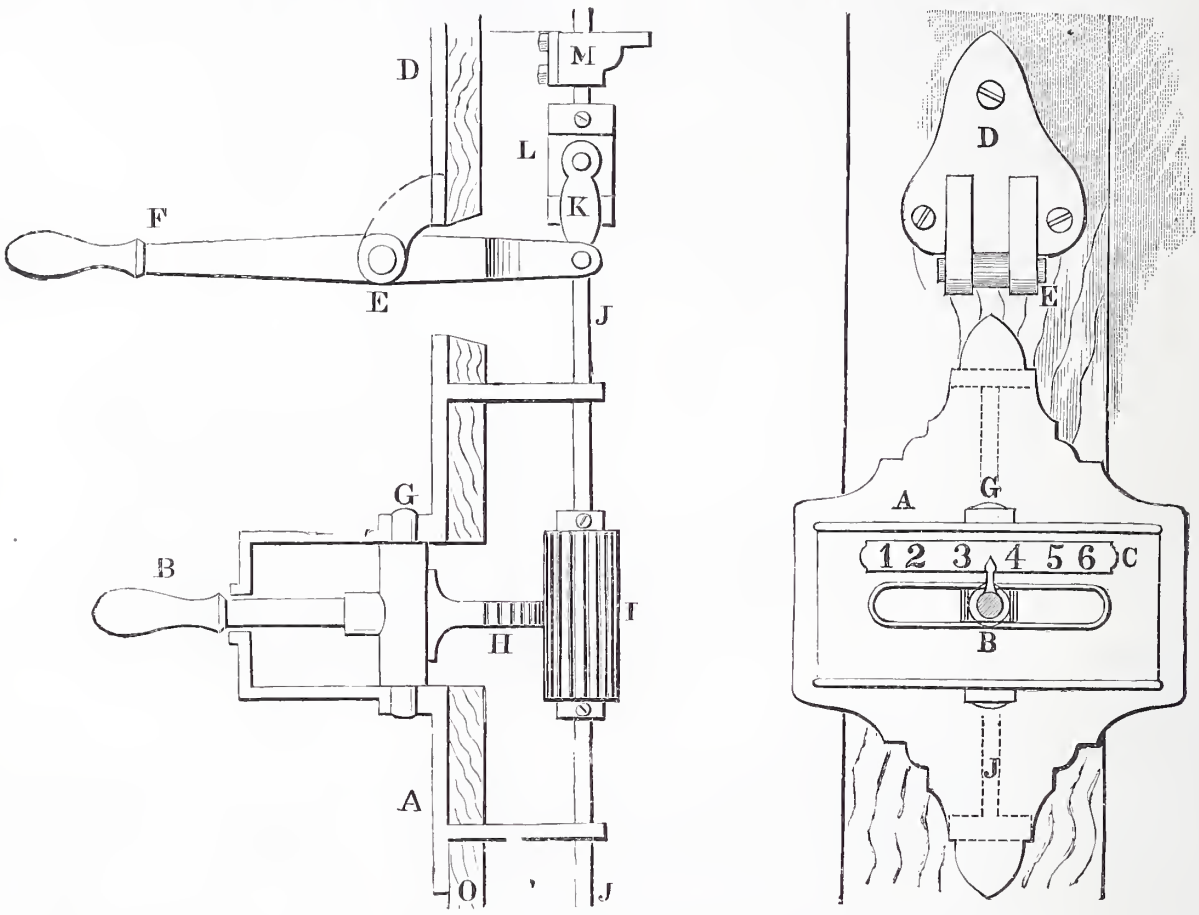


Fig. 7.—Operating Mechanism of an Automatic Freight Elevator, made by the Tewksbury Automatic Elevator Co., New York.

to a drum arranged for receiving the wire hoisting rope. Change in the direction of motion is accomplished by the usual tight and loose pulleys.

The features peculiar to this elevator, and from which it derives its character as automatic, are shown in detail in the accompanying engravings. The rod J extends from the top to the bottom of the lift, and is supported in boxes in such a way as to be free to be moved vertically up or down, or to be rotated one entire revolution. A specially devised coupling, not shown in the engraving, is used in joining the lengths of rods together to form the entire hight required. To the bottom of the rod J is attached one end of a lever, the other end being connected with the shipper rod, through the operation in which the belts are shifted for motion of either direction, or for bringing the car to a state of rest. Putting the elevator in motion is accomplished by moving the lever F in a direction, either up or down, according to the direction in which it is desired to have the car move. This lever, it will be seen, moves the rod J, to which it is attached by means of a loose collar and links. The loose collar A works between two fast collars, the arrangement of parts being necessary to provide for moving the rod up or down for

Practical Stair Building.—XXI.

STAIRS WITH A QUARTER TURN AND WINDERS NEAR THE TOP.

The next practical problem to which we shall direct our readers' attention is a flight of stairs with a quarter turn at the bottom, and winders near the top; also having a cylindrical turn-out, with winders at the bottom. The general features of this problem are clearly presented in the accompanying engraving, which shows the outline of the stairs in plan, with the various parts and forms used in the construction shown in their correct positions. To construct the plan, first draw the line representing the face of the wall string. Next decide how wide to make the stairs, and draw the front line representing the center of the rail. Make the cylinders of a fair size, with a radius of from 6 to 12 inches. Decide where to fix the point A, which represents the point of the miter where the rail joins the newel cap. Draw the radius line I A. At right angles with I A, draw the tangent A B, meeting L C, produced at B. Fix the center of the newel cap on a line with B A, and distant from A half the width of the rail. Draw the edge lines of the rail near A, as shown in the engraving. With a radius equal to the width of the rail, draw the circumference line of the cap, meeting the edge lines of the rail. Draw the miter lines of the cap crossing each other, and produced as shown in the diagram. At a suitable distance from the newel, mark the position of the short balusters on the second step. From this point space off all the other balusters at such distances apart as may be necessary to secure a sufficient number of winders and straight steps.

Draw the dotted line shown in the engraving running parallel with the front stringer, and about 18 inches from it. On this line divide off the width of the treads, all nearly alike, and so as to come out correctly at both top and bottom. Mark the points where the risers come at the front string, making

those winders which come next to the straight steps as wide as may be, to aid in forming good easements on the lower edge of the string. Care must be taken, however, that no baluster shall be interfered with by the nosing of the step next above it. From the points in the front string, obtained as above stated, draw the riser lines nearly through the points marked on the dotted line, making, however, the distance at the wall string even inches or half inches, marking them as shown in the plate. After the figures have been put down in this manner, it is well to prove them by adding together all those which occupy one line, and noting the result in comparison with the known length of the line. In a similar manner figures ought to be placed at the face line of the front stringer. That line, however, is omitted in the engraving to avoid confusion of lines, and therefore is not shown in the example here given. When this preliminary work has been done, the next problem to be considered is the construction of the rail.

The first piece at the bottom is of the kind described in our sixteenth article, and may be found on page 228 of the issue for December, 1881. The tangent A B remains level, while the tangent over B C rises with a very steep pitch.

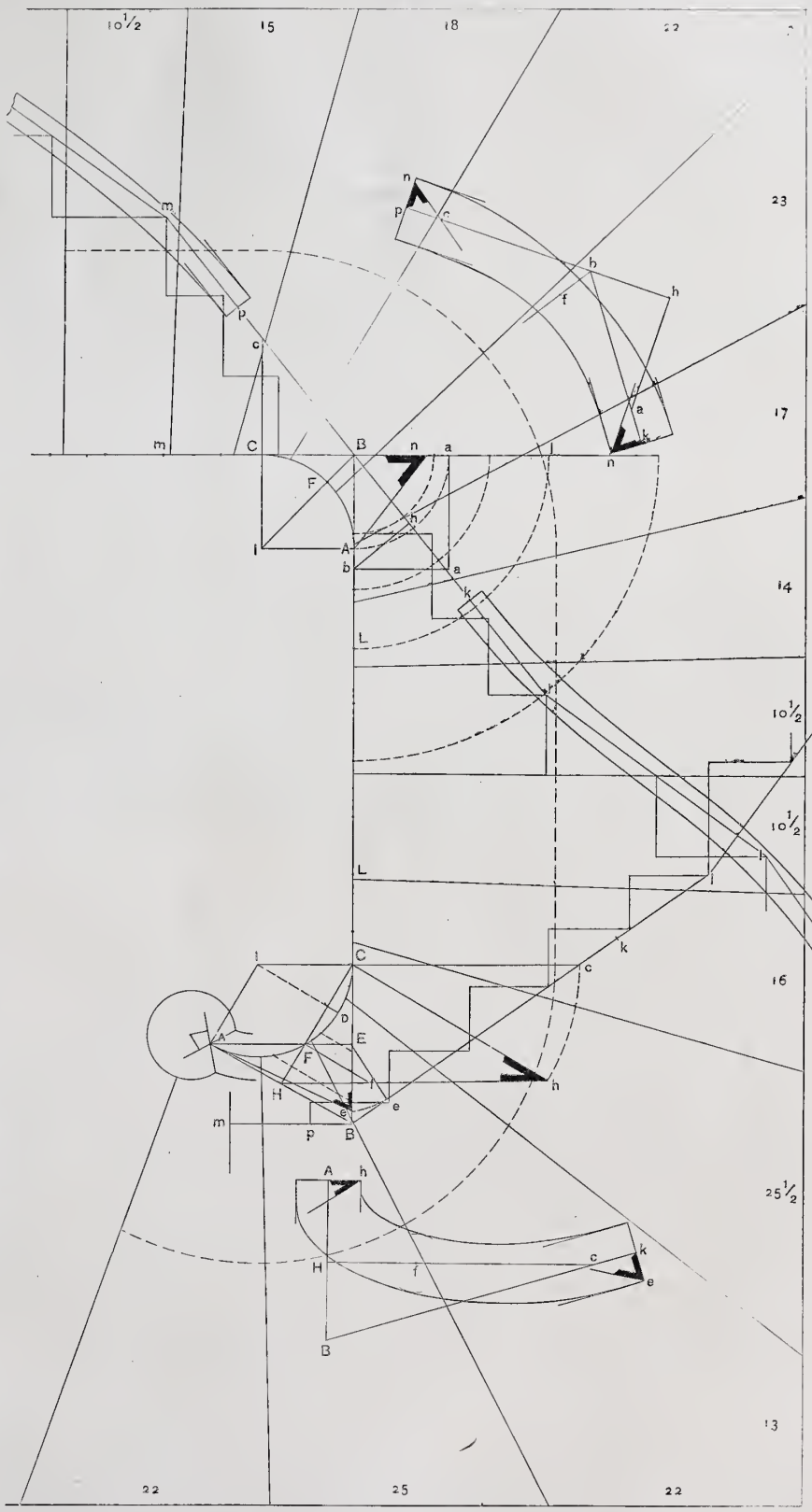
To fix the inclination of the elevated tangent B *c*, over B C, proceed as follows: From each of the balusters on the curve line A C, draw dotted lines parallel with A B, and meeting the line B C. From the points thus found as a base line, draw their elevation in the manner shown in the engraving. In starting this elevation, make B *m* equal to one rise and a half. B *p* is one-half the rise. The floor line is indicated by *m*. Continue the elevation up into the straight part of the stairs, as shown. The riser lines in this elevation represent the short balusters. Now from B draw the line B *l*, as nearly as possible through the short balusters. This line meets the regular pitch line of the stairs at *l*. Draw the perpendicular C *c*. B *c* is the elevated tangent over B C. From C, draw C H at right angles with A B. Draw C *h* at right angles with C H. Make C *h* equal to C *c*, and draw the bevel line *h* H. From the point F, where C H crosses the curve line A C, draw F *f* perpendicular to C H. Draw A E at right angles with B C. From E, draw E *e* at right angles with B *c*. From E as the center, strike the arc *e e*. Draw the bevel line *e* A.

To draw the rail pattern, lay down the line A H B, equal to A H B in the diagram just described. At right angles with A B, draw H *c*, equal to the bevel line H *h*. Through *c*, draw B *c* K. For the sake of straight wood, the length *c k* is added. Take H *f* equal to H *f*. Then *f* is a point on the center line of the pattern. At A and *c* make the pattern about one fourth wider than the rail. At *f* make it about one sixth wider than the rail, and with short parallel lines, to serve as guides at each end, draw the inside and outside lines of the pattern, touching the short arms as shown. In theory, the narrowest part of this pattern should be over D, where the first quarter-circle ends. This point on the pattern would be about half way between *f* and *e*. The plumb bevel at A is indicated by *h*, while *e* is the plumb bevel at *k*.

To draw the plan for the wreath-piece at quarter-turn, proceed as follows: First draw the square A I C B. From the baluster F, draw the line F B at an angle of 45 degrees with A B. Produce C B to *k*, and by means of the dotted arc lines transfer the point A, and the short balusters on the line B L, over the line B *k*. Beginning at B, draw the elevation of the short balusters, as shown in the engraving. Conforming as nearly as possible to this plan, draw the pitch line *l m*, meeting the line of the straight rail above at the point *m*, and the line of the straight below at *l*. Draw *a a* perpendicular to B *k*. Draw *a b* at right angles with B L. Draw C *c* perpendicular to B *m*. Now *a* B and B *c* are the elevated tangents over A B and B *c* respectively. Draw *b h* at right angles with *a* B. Take B *n* equal to *b h*, and draw the bevel line *n* A.

To draw the rail pattern, make *h b c* equal to *h* B *c*. Add *c p* for straight wood. At right angles with *c h* draw *h a*, equal to the bevel line *n* A. Draw *b a*. Add *a k* for straight wood. Bisect the angle at *b*, by the line *b f*. Make the distance *b f* equal to B F. At *a* and C, make the pattern about one fourth wider than the rail, and at F, slightly wider than the rail. In the usual manner, as before described, draw the inside and outside lines of the pattern. At *n* the plumb bevel for both ends of the piece is indicated.

The ramp piece, beginning at *p*, connects the wreath-piece with the straight rail above.



Practical Stairbuilding.—Stairs with a Quarter Turn and Winders Near the Top.

The ramp piece *k l l k*, occupies the space between the two wreath-pieces. The lower point *l* in this elevation corresponds with *l* in the first elevation. The points *l* and *l* in the elevation stand over L and L in the ground plan. The comparative hights of the short balusters may be measured on the elevation.

An article is going the rounds of the daily press with the very taking title of "Coal by Wire." It is an outgrowth of speculation upon the possibilities of the dynamo of the future. The gist of the article is this: That by utilizing the immense water powers of various parts of the globe in driving dynamos, the power may be sent as electricity over comparatively small copper conductors to any point where it is desired to use it. This, of course, will do away with the necessity for the transportation of coal. It would also be possible to utilize the coal at the mines in driving engines, and then transmit their power to great distances, the profit, in that case, coming from cheap coal and the saving in its transportation. The possibilities of new combinations which the dynamo presents are so great, and our knowledge of its limitations so comparatively small, that the imagination is prone to run riot. At present we must wait for improved forms of dynamos, for there is too great a percentage of loss to allow us to introduce them into any and every situation.

Calculating Strains.

(Continued from page 127.)

The next form of roof truss which we shall take into consideration, is one where the rafters are supported at points midway between their extremities, as shown in Fig. 18.

Each point of junction of two or more pieces is considered a joint around which the

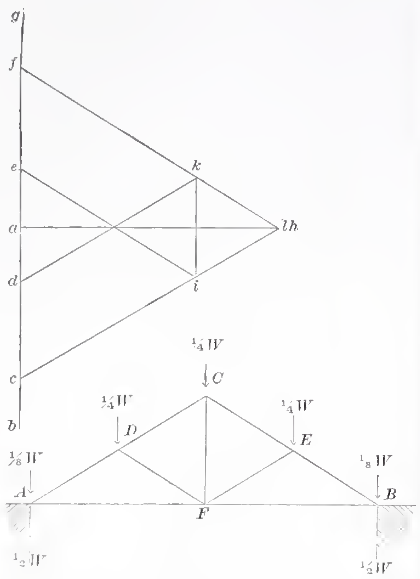
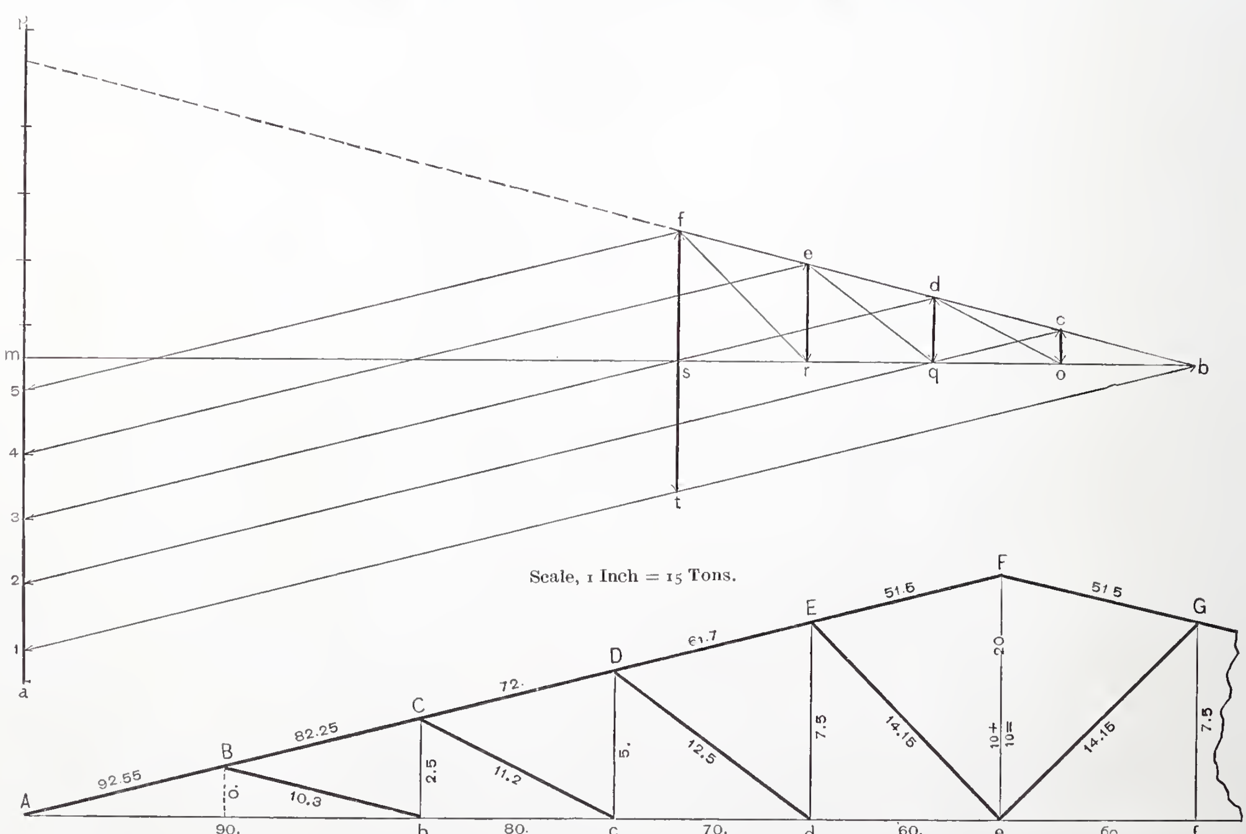


Fig. 18.—*Stress Diagram of Roof Truss of the General Form of A B C F.*

pieces would be free to turn were they not restrained by their connections with other points. Whatever stiffness the joint may possess from friction between its parts, or from a continuity of a piece, is not taken into account, but does add somewhat to the strength of the truss.

In the truss before us, therefore, half of the load on A D will be carried on the joint



Calculating Strains.—Fig. 20.—*Stress Diagram of Roof Truss of* 100 *Feet,* 50 *Tons Total Load. Form of Truss, A F e.*

A. The joint D will carry the other half, and also one-half of the load on D C, and so on; hence the load at the joint A will be $\frac{1}{8}$ W, at each of the joints D, C, and E, it will be $\frac{1}{4}$ W, and at B again $\frac{1}{8}$ W.

Now, to draw the strain diagram proceed as follows: On a vertical line *g b* lay off *g f* = $\frac{1}{8}$ W, *f c* = $\frac{1}{4}$ W, *e d* = $\frac{1}{4}$ W, *d c* = $\frac{1}{4}$ W, and *c b* = $\frac{1}{8}$ W. As the walls support the whole truss, the supporting forces will be *g a* = *b a* = $\frac{1}{2}$ W. Now, for the joint A, *b c* = load, and *b a* = the supporting force; then draw *a l* parallel to A B, and *c l* parallel to A C; *a l* is tension in A F, and *l c* compression in A D. At the joint D the load is *c d*, the stress on A D just determined is *c l*; then draw *l k* parallel to D F, and *d k* parallel to D C, to close on *d*; *l k* is then compression on D F, and *k d* compression on D C. Passing next to C, the load at that joint is *d e*, and *d k* the thrust of C D on it. Draw *k i* parallel to C F, and we obtain the tension in C F, and to close on *e* draw *i e* parallel to C E, which is the compression in C E. Take next the joint F at the middle of tie A B; we have *i k*, then *k l*, and next *l a*, the last of the known stresses. The next piece to which we come is F B; as we have just arrived at *a*, we must pass back horizontally until a line from *h* parallel to F E will close on *i*, the point from which we started. The remaining line *h f* is easily determined by taking either of the joints E or B. It will be noticed that since the truss is symmetrically constructed and loaded, the stress diagram must be symmetrical; hence *a l* bisects *i k*, aud *d k* and *e i* must intersect on *a l*. Attention to these points insures the accuracy of the drawing.

It is impracticable to determine the stress at any joint where more than two forces are unknown. In the present case we could not start with the joint D or with C, for we should know the external force or load only, and have three unknown stresses to find; therefore our parallelogram of forces, having one side known, might have the other sides of any length, while they were still parallel to the pieces of the frame. By taking the joints in the order just observed, this difficulty is not met with.

The next truss which we shall consider is one well adapted for construction in timber, the verticals alone being iron rods. It is of the form shown in Fig. 19, and can be used in large spans. Before commencing to draw the diagram, assume an approximate value for the weight of the whole truss, add so much of the weight of the boards, slats or other covering as is supported by one truss, and divide this total weight by the number of parts, such as A D, D E, E F, &c., in the two rafters, to obtain the "panel-load," and thereby the weights which are supposed to act at each joint. The weight at the joints A and B will be a half panel-load, and at all the other joints be equal to a whole panel-load. If the rafter is not supported at equidistant points, divide the total load by the combined length of the two rafters to obtain the load per foot of rafter; then multiply the load per foot by the distance from the middle of one piece of the rafter to the middle of the next to obtain the load on the joint which connects them.

Begin by drawing the load line *b p*, making *b c* equal to one-half a panel-load, *c d*, *d e*, *e f*, *f g*, &c., each equal to a whole panel-load, and closing at *p* with a half panel-load again, as at *b*. The point of division, *a*, at the middle of the load-line *b p*, marks off the two supporting forces *p a* and *b a*, which close the polygon of external forces.

Commencing now at A, draw as heretofore directed, *a b c h a* for this joint. The order of these letters gives the directions of the

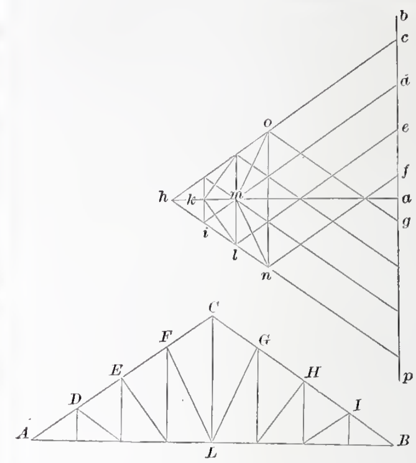


Fig. 19.—*Stress Diagram for Roof Truss of the Form A C B L.*

forces on the joint A. Then, for the joint D we have *h c d i h*; taking next the joint at the foot of the vertical from E, we have *a h i k a*; for the joint at E we have now *k i d e l k*; for the joint at the foot of the vertical from F we have *a k l m a*; for the joint at F we obtain *m l e f n m*, &c. Observe that by taking the joints in this order, first the one on the rafter and next the one below it on the tie, we have, in each case,

only two unknown forces out of, on some joints, five forces; and that it is expedient, when possible, first to pass over all the known forces at any joint, taking them in the order observed with the external forces when laying off the load line. The rest of the diagram presents no difficulty. After the stress on the joint L is obtained, the stress on C G is the same as in C F, and the diagram will begin to repeat itself inversely. It is, therefore, unnecessary to draw more than one-half of the figure, although it has been done here. But, in drawing only one-half the figure, it must be remembered that each vertical tie bears the vertical strain in that strut to the lower end of which it is attached, and, therefore, the center tie, C L, receives the strain from both the struts L F and L G, which makes its value equal to n o, as shown in the stress diagram of Fig. 19, while the values of the verticals from F and E are m l and i k, respectively.

We shall proceed now to apply the foregoing to the working out of a practical example. Suppose it is required to find the strains in the different members of a roof truss of the form shown in Fig. 20. Let the span be 100 feet, the hight at the center of the truss e F be 12.5 feet, the horizontal panel lengths d e, c d &c., be 10 feet, and the total weight of truss and load combined be equal to 1000 pounds per lineal foot of span, or 50 tons for each truss.

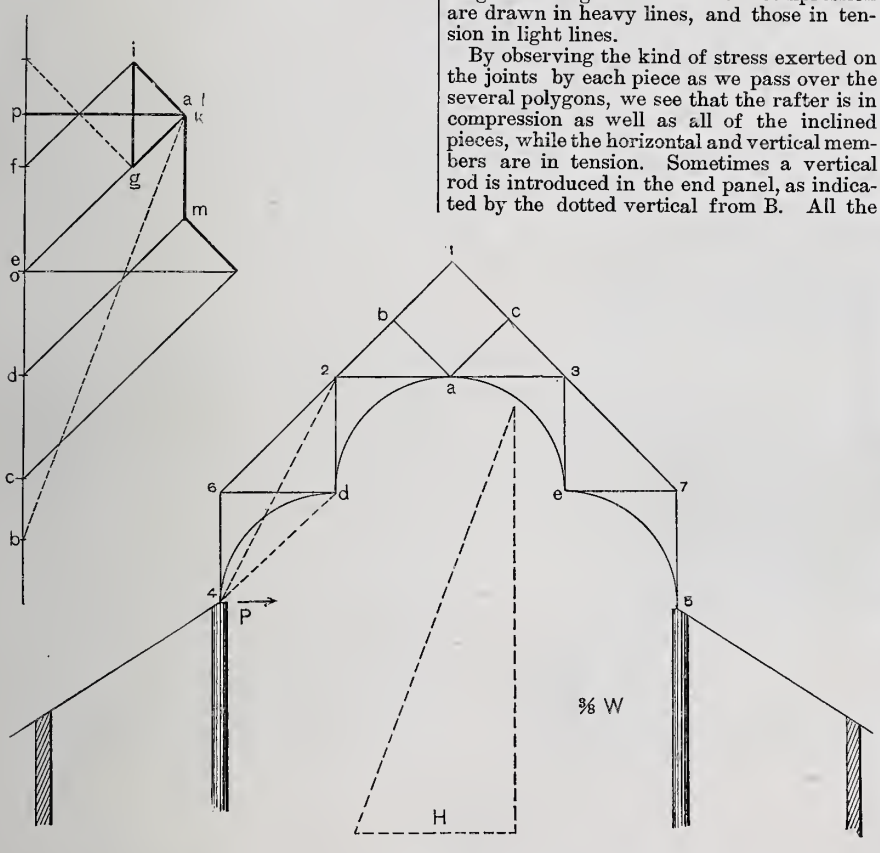


Fig. 21.—Stress Diagram for Hammer Beam Truss of the Form 4, 6, 1, 7, 5.

As the truss is symmetrical, only a little more than half of it is shown in Fig. 20. Draw first the diagram A B C D E F G f of the truss to a scale of 1 inch = 20 feet. Next assume for convenience a scale of 1 inch = 15 tons, for the stress diagram. Draw the vertical a p, and by this scale lay off a-1=2.5 tons, or ½ panel-weight acting at joint A, and then successively 1–2, 2–3, 3–4, each equal to 5 tons, or one whole panel-weight acting upon the joints B, C, D, E, &c., making a p = 50 tons, and a m = m p = 25 tons, the supporting forces at the ends of the truss.

Beginning now at A, the forces acting at this joint are first m a, the supporting force, then a–1, one half the panel-weight. To get the compressive strain in A B, draw 1–b parallel to A B, and next b m parallel to A e to close on m and to obtain the tension in A b. Measure now by the scale 1 inch = 15 tons, the lines 1–b and b n, and we obtain for compression in A B = 92.55 tons and tension in a b = 90 tons. Next take the joint B. For this joint we have now b–1, 1–2, 2–c, and c b parallel to B b to close on b. Measuring again the new strains found, we obtain 2–c = 82.25 tons compression in B C and c b = 10.2 tons compression in B b. For the joint b we have m b c o m, from which we obtain the two unknown strains in C b and b c viz:

c o = 2.5 tons for tension in C b and
o m = 80 tons for tension in b c.

Next take joint C and we obtain o c 2 3 d o, d o parallel to C c for strain in C c, and to close on o. We now have 3–d = 72 tons, compression in C D and D O = 11.2 tons for compression in C c. In the same way we obtain next at joint c, d q = 5 tons tension in D c and q m = 70 tons tension in c d. At joint D we find 4–e = 61.7 tons compression in D E and e q = 12.5 tons compression in D d, and so on till the joint e is reached, when the strains will be found to repeat themselves inversely, in consequence of the symmetry of the truss and its load. The strains in the different members of truss are marked in the lower diagram of Fig. 20. Members in compression are drawn in heavy lines, and those in tension in light lines.

By observing the kind of stress exerted on the joints by each piece as we pass over the several polygons, we see that the rafter is in compression as well as all of the inclined pieces, while the horizontal and vertical members are in tension. Sometimes a vertical rod is introduced in the end panel, as indicated by the dotted vertical from B. All the work which can ever be done by this rod is to keep the horizontal tie from sagging, by sustaining whatever small weight is found at its foot. Where the horizontal tie is made of timber, it is absolutely superfluous. That this rod has no work to do if the load is concentrated on the joints of the rafter—as will be the case when the purlins are put over the joints—can be found out from the stress diagram. Taking the joint at the foot of the dotted line below B, we have three pieces in equilibrium; we therefore begin at m and pass to b, along the stress line determined; then we should draw a vertical line and from its extremity a horizontal back to a, the starting point. This vertical line, therefore, can have no length, and hence there is no strain in the vertical from B.

The next form of truss which we shall consider is one where the walls have not merely to support the truss and its load, but are also subject to a horizontal thrust, in consequence of the peculiar framing of the truss. Fig. 21 represents a frame which is commonly called a hammer-beam truss. It is a very handsome type of roof trussing and finds most frequent application in church architecture. When the church has a clear story, the windows come between the trusses, the truss is supported on columns, and the roof of the side aisle takes up the horizontal thrust. If there are no side roofs, the main walls must be properly strengthened by buttresses. It will first be well to remember that a curved piece in a truss, so far as the transmission of force from joint to joint is concerned, acts as if it lay in the straight line between two joints. The curved members in the diagram Fig. 21, are quadrants of a circle, but they may have any other curve, depending somewhat upon the pitch of the roof. If we now consider the point of support (4) of the truss and remember that the curved piece (4–d) transmits the force between its two extremities as if it were straight, it will be evident that the thrust of the inclined piece must have a horizontal component which cannot be neutralized by a vertical supporting force alone. Therefore, in addition to the reaction of half the weight of the roof and truss, there must be supplied by the wall, assisted say by a buttress or a side-roof, a certain horizontal thrust.

To determine the value of this thrust let W equal the weight of truss and load. We have nine loaded joints, and there is, therefore, ⅛ W at each joint, except the two extreme ones. Draw the dotted line from 4 to 2, and a similar one from 5 to 3. The whole truss may then be considered to be made up of a small triangular truss (1, 2, 3,) carried upon a trapezoidal truss (4, 2, 3, 5) the braces 4–2 and 3–5 being made up of an assemblage of pieces. As the load is symmetrically distributed, the trapezoid requires no bracing and d a will have no stress upon it, but will come into action under wind pressure. Considering then the trapezoidal truss (4, 2, 3, 5) alone, the joint 2 will carry a load equal in amount to ⅜ W, the joint 3 will carry the same amount, and the joints 4 and 5 will each carry ⅛ W. If then we lay off on a vertical line ⅜ W for the load on 2, and draw lines parallel to 2–3 and 2–4 from its extremities, the line parallel to 2–3 will be the stress in the same, and will also, since the load is vertical, be the horizontal thrust of the foot of the compound brace 2–4. This force is marked H in the dotted triangle drawn below the truss.

We have now the data for the stress diagram, of which one-half only is here given. For the point 4 we have the upward supporting force b p = ½ W; next, p a, the horizontal thrust of the wall, &c., against the joint a o parallel to the line of action of 4–d, and, finally, o b the pressure of the post 4–6 on 4. The resultant b a of p b and p a may, of course, be used for the reaction of the wall. Taking next the joint 6, we have c b the load, b o the thrust of 4–6, and we then draw o n and n c. The joint between 6 and 2 gives d c n m d. The joint d already has the lines m n, n o and a o; since the line which must close on m must be parallel to 2–d, and a is already vertically over m, a l can have no length, and there is no stress on 2–d. Upon taking the joint 2 we find also that no stress exists on 2–a. This fact is not at variance with the value H, which was said to exist in 2–3 when we considered the trapezoid alone. The triangular truss (1, 2, 3) will plainly cause a tension in 2–3, and with this distribution of load, such tension will exactly neutralize the compression caused in the same piece by 4–2. If we consider the truss as loaded only at 6, 2, 1, 3 and 7, thus doing away with 1–a, b a, a c and the two braces from d and e to the main rafters 1–6 and 1–7, we shall find that the stress diagram does give some compression on 2–a.

(To be Continued.)

A Correction.

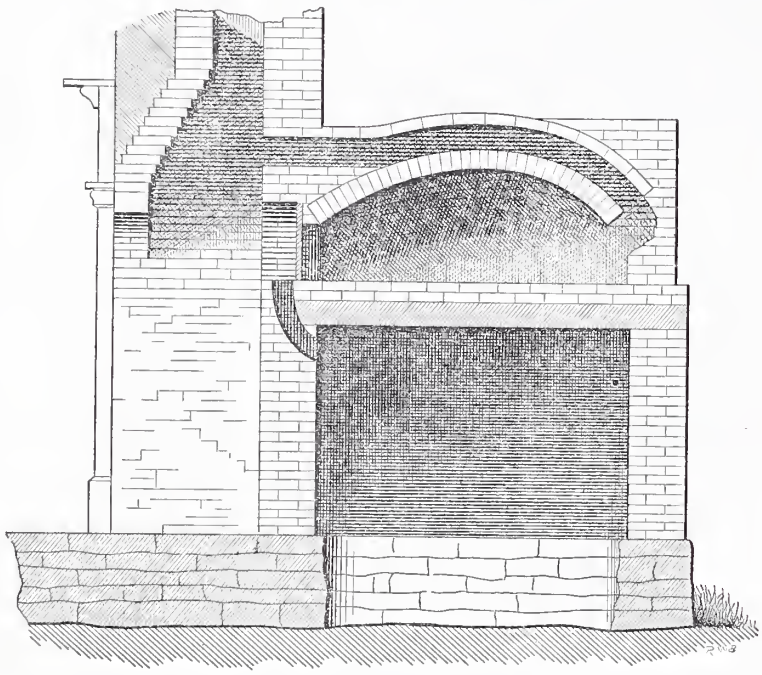
By some inadvertence, in our July number an errror in the statement of the results of the sixth competition was made. Mr. Theodore A. Richter, Jr., south-east corner of Fifth and Walnut streets, Cincinnati, Ohio, was awarded the second prize instead of the third prize, and Mr. B. C. Pond, of Auburndale, Mass., was the recipient of the third prize instead of the second. The official notification to these two gentlemen was correctly made, and the error occurred simply in the statement made in our published announcement. We owe these gentlemen and our readers an apology for the error.

Though a strong man, the carpenter cannot raise his frame without assistance.

CORRESPONDENCE.

Bake Ovens.

From W. D. H., *Gap, Pa.*—From the description of E. W. T. who asks about ovens in the April number of *Carpentry and Building*, I presume that the article he speaks of is the same that is so common with us. They are so common that the farm house, old or new, that is without its bake-oven is hard to find. We don't consider ourselves so terribly old-fashioned either. We never see them built of fire-brick and never hear them called Dutch ovens. Sometimes they are built away from the house, but very frequently they are built against the kitchen in such a way that the mouth of the oven opens into the fire-place of the kitchen. By this arrangement the baker need not go out of doors to attend to her oven, but can do all in the kitchen, which not only saves the housewife many steps, but reduces the risk in case of fire. There is one plan which I will try to describe. The foundation is built 6 feet square, of stone on three sides. The fourth, or front side, is formed by the back wall of



Bake Ovens.—Sketch Inclosed by W. D. H., Showing Manner of Construction.

the kitchen fire-place and is of brick. The foundation is hollow and arched over. The bottom of the oven is 3 feet 6 inches above the kitchen hearth. The inside of oven is 5 x 4 feet 6, the longer dimension being from the mouth of the oven to the flue. The hight in the center from hearth to roof is 18 inches. The top is built nearly the shape of the upper shell of a tortoise. The hearth is laid with hard-burned brick without mortar. In building up the front we leave an opening the width of the oven door, and just outside of door, to conduct the coals and ashes to the ash-pit under the oven, we leave an opening as shown in the sketch. An opening is provided in the foundation, by which the ash-pit may be cleaned out from time to time, and we close the same with a flat stove or an old stove plate. The front of the oven is built up with the chimney of the kitchen. We use an iron fire door 14 by 18 inches. We leave an opening for the squirrel-tail flue, as it is called, 4 inches square, about 26 inches above the hearth of oven. We lay the foundation of the arch and fill with sand, packing solid, and shaping up for inside of oven. The arch is built of hard brick and good mortar, leaving an opening at the top part of arch to start the flue. The flue is built with brick on edge, and covered with brick laid flat. All is plastered with a good coat of strong mortar, filling up any cracks that may show when it dries. We cover it by setting a frame for the corners of wall, weather-board it up, and finish either with a shingle or board roof. We remove the sand after the plaster is dry. The draft through the oven is regulated by means of a sliding rick in the opening of flue. Both flue and fire door are opened when the fire is started. Dry wood is used, and the fire is built in the front part of the oven. When heated, the ashes and coals are drawn out, the baking is put in, and both flue and door are closed. If the oven is built away from the house and without connection with the flue, the smoke escapes by means of the squirrel-tail opening, the same as here described.

From D. L., *Lock Haven, Pa.*—In the April number of *Carpentry and Building* I noticed an inquiry with regard to Dutch ovens. As it is directly in my line, I submit, for the benefit of E. W. F. and others who may be interested, a description of my plan of building such structures. Prepare foundations 5 feet 6 inches long, 4 feet 6 inches wide, and 2 feet 6 inches high. These foundations should be built hollow and arched so as to form the ash-pit under the oven hearth. Build a 9-inch wall three courses high on the back and along the two sides, cutting the corners so as to form the oven into an oval. For the front build a 13-inch wall, in order to form a flue over the door. The size of the door should be 18 inches wide and 13 inches high. The flue should start immediately above the top. Build the flue about 8 feet high. In size, outside measurement, it should be 21 by 13 inches. Just inside of the door should be an opening in the hearth through which to drop ashes into the pit. Pave the bottom with hard brick. By the aid of combustible material shape the oven as required to the hight of 17 inches. Finish up with sand. Turn a 4-inch arch of red brick, leaving a hole in the back of the oven for a squirrel-tail flue to run over the top and connect with the flue over the door. Give the crown or arch a good coat of mortar, roof over the structure, put a damper in the flue above the squirrel flue. Fire the oven until the brick are clear of dampness and soot. It is then ready for use. An oven of the above dimensions will bake 10 loaves of bread. The material required will be 600 brick, 3 bushels of lime, one yard of sand, 3 perches of stone for the foundation. A mason should execute the work in about two days. Ovens built upon this plan have always given good satisfaction.

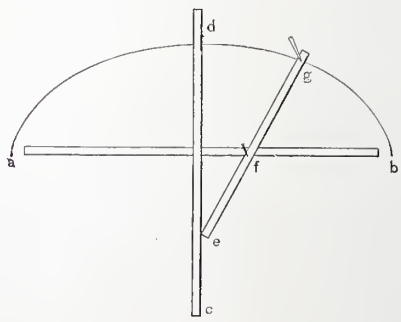
Withholding Information.

From P. O. B.—Hush, boys! Don't one of you tell what you know. Our fellow-reader, R. B., says he has no doubt that he could give valuable suggestions as to simplifying some of the methods which have been published in *Carpentry and Building*. He declines to give away what he knows about stair rails, because it might be working him out of a job. He is a foreman. I pity the men who work under him. I happen to be a foreman myself, but I am not afraid of losing my position by helping the men all I can. It helps me along, and frequently makes less work for me to do in looking after that which is under my charge. If R. B. cannot hold his job save by keeping his knowledge under lock and key, I feel truly sorry for him. I am acquainted with one or two men of the same quality. I know one man who refused to give me lessons once upon a time, although I wanted to pay him for his trouble. Men of this kind are like the dog in the manger. I am able to put up stairs and rails as well as the men who work under me. The knowledge I have I have obtained by my own efforts and from the books which I have bought. I think if mechanics generally would do more studying and less running around evenings it would be to their benefit. They would learn to master more difficult work.

To A. A. F. I desire to say: Lock up what you know and keep it safe. It might leak out. Besides, we do not wish to learn from men who are not liberal with their knowledge. We can study and practice on models, and by this means save being under obligations to teachers. If mechanics generally would investigate for themselves they would become better mechanics, and would be independent of foremen of the kind who have been writing for the paper.

Drawing an Ellipse.

From J. C. L., *Walla Walla, Washington Ter.*—For the benefit of H. D., who inquired in the May number of *Carpentry and Building*, I will give the method of striking elliptical arches that I have practiced for a number of years. It has the advantage of being simple, accurate and convenient. Let A B of the sketch I inclose represent the base line or width of opening for arch. Draw the line C D exactly in the center and at right angles with A B. Then tack a straight-edge on C D, so that one edge is exactly on the line C D, as shown in the sketch. Make a rod, E G, one half the width of opening for arch. Drive a small nail in the strip E G at the point F. Hold the rod parallel and against the straight-edge. Place a pencil at the point G, and move it with the end of the rod to the right, keeping the nail against the base line, and the lower end of the rod against the side of the straight-edge. By this means that portion of the ellipse from

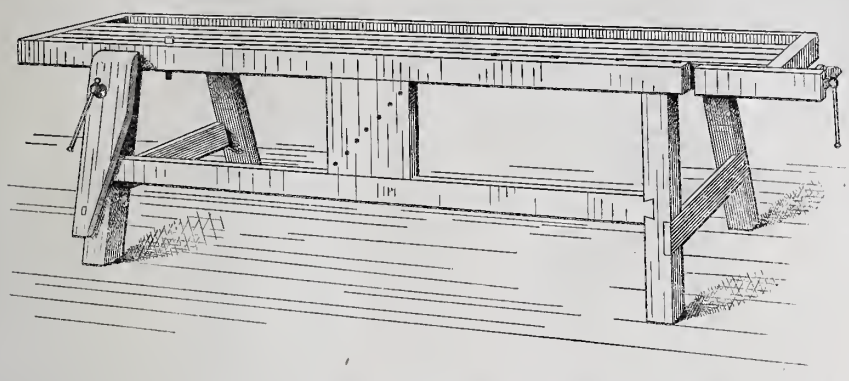


Drawing Ellipses.—Sketch Submitted by J. C. L.

D to B will be drawn. Take off the straight edge and move it to the other side of the line C D, and proceed in the same manner to draw D A. This plan admits of drawing elliptical arches to proportions as required, according to the space or opening in which the work must be done.

From R. A. B., *East Providence, R. I.*—I am something like your correspondent H. McG., a practical reader of *Carpentry and Building*. I study it to obtain ideas concerning the carpenter's trade, which I am learning. I frequently encounter questions which I am disposed to answer, and quite as often pick up items that are valuable to me. I think I can tell O. T. B. a better way of drawing an ellipse or oval than what he is at present using. If he will take a copy of Webster's Unabridged Dictionary and look

at the definition of the word "trammel," on page 1401, he will find there described an instrument which will describe an oval of any required proportions. I have one in use which I made from the description there given. By it I can produce an ellipse 4 inches wide and 4 feet long, or 3 feet 11 inches wide and 4 feet long, as well as anything between the two extremes here mentioned.



Carpenters' and Cabinet-makers' Bench.—Sketch Accompanying the Communication From W. A. Y.

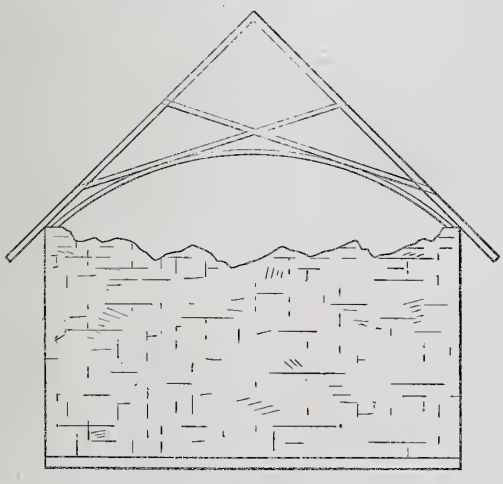
I think A. X.'s workbench quite a contrivance, and an improvement over the common way of making benches, while small enough to get out of a house after it is finished. The way we do it here is to saw the legs off, and then, if the bench is used again, we nail them in place.

Carpenters' and Cabinet Makers' Bench.

From W. A. Y., *Pierce's Landing, Pa.*—I inclose a sketch of a workbench we have had in use for the past three years, and which has given entire satisfaction. We regard it as the best style of bench made for the combined use of a carpenter and cabinet maker. Its construction is such that any mechanic of ordinary ability should be able to put it up. The bench may be made of any length or width desired. The one we are employing is 10 feet 3 inches long, 33 inches high, and top 18 inches wide, with a 9-inch trough on the back, making the total width of top 27 inches. The top is made of alternate strips of walnut and ash, 4 inches wide and 1 inch thick, glued together and nailed. The two front strips, however, are not nailed, but are put together with screws from the inside. The holes for the stops are 1½ inches from the front edge of bench, and are 1¼ inches square and 3 inches apart. The headers are put on the ends with joint bolts 7 inches long. The headers are 3 by 4 inches square. The two front legs are pitched forward 10 inches at the lower end. The hind leg on the front side stands plumb, while that on the back side of the bench is pitched back 8 inches. The front leg on the back side pitches back 8 inches and forward 10 inches. The vise leg is made of 4 by 5 stuff. The other legs are 3 by 5, mortised in the top 3 inches deep. The strip between the legs on the front side is 4 inches wide, 1 inch thick and beveled on both sides at the top, making it V shaped. The front edge of top of bench is plowed out to receive the slide, the plow being ½ inch wide. The slide is made of 1 inch stuff, 14 inches long and 12 inches wide. The top of the bench is cut back 5 inches for the tail slide. The header on the back end projects about 4 inches to hold nut of tail screw. The tail slide is dovetailed together. With these explanations and the sketch inclosed I think that almost any one will comprehend the construction of a bench which is quite satisfactory to us.

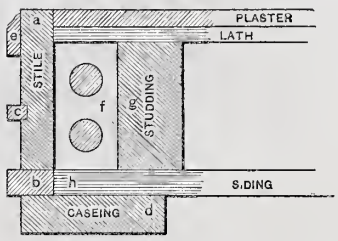
Church Roof.

From T. P., *Franklin, N. C.*—I desire to build a church of about the following dimensions: 34 feet in width, 50 feet in length, the walls to be 17 feet above the floor. The ceiling I desire to arch in such a manner as to give 25 feet from the floor to ceiling. The walls are to be of brick or stone. Can I construct a roof according to the accompanying diagram that will hold and support the plaster so as to prevent cracking or sagging? If so, what size should the rafters and braces be to insure safety, and how should I connect the braces to the rafters? My own idea is this. I propose that the rafters shall be 2 x 8 inches, and the braces the same size. I propose to let the braces lap full thickness on the rafters and to be fastened in position by means of bolts and nuts. I propose, also, that bolts shall be used where the braces cross each other. As indicated in the diagram, the rafters and braces will constitute a bent. I propose to place these bents 2 feet apart, measuring from centers. If I am not correct in my calculations of this matter, will some reader inform me as to what will be better?



Church Roof.—Sketch Accompanying Inquiry From T. P.

Note.—We shall be pleased to have our readers respond to this question, as requested by our correspondent, merely remarking that it is possible he can construct a roof in the manner indicated, although the absence of a tie at the bottom is objectionable. Any deflection of the rafters will allow the walls to spread. We raise the question for the consideration of our readers while answering his question, whether this is the best design for a country church roof that might be devised. We are not as well pleased with a flat-arch ceiling as we would be with some other forms. We think the impression in entering a building of this kind would be similar to that of going into some of the old-fashioned passenger coaches without the ventilating lights at the top of the roof. A low, flat arch, we think, is quite undesirable for the purpose. Those of our correspondents who give this question attention will no doubt confer a benefit upon this reader and others by suggesting changes in his design, as well as answering questions which he raises.



Construction of Box Window Frames.—Fig. 1.—Cross Section Through Frame, Arranged for a Frame Building.—Submitted by L. H. H.

Box Window Frames.

From L. H. H., *Summitville, Ind.*—I inclose a sketch which I send as being of interest to the several correspondents who have asked about the construction of window frames. Fig. 1 is what we call in Hoosierdom, a skeleton box frame, or rather a section through such a frame, showing the construction. This, as I understand the correspondents, is what is wanted. Fig. 2 shows a section through what is called a full box frame, as adapted for use in frame houses. Fig. 3 shows a box frame adapted for use in brick houses. The drawings so clearly explain themselves that no further particulars are necessary.

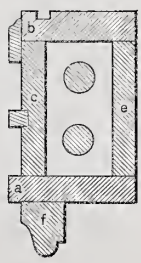


Fig. 2.—Cross Section of Full Box Frame for Use in a Frame House.

From T. A. R., *Cincinnati, Ohio.*—In answer to the question proposed by I. H. H., Bell Green, Alabama, I would say that a box frame as shown in the accompanying sketches is constructed of ⅞-inch pieces well nailed and housed into 1¾-inch head piece and sub-sill. The 1¾-inch hanging stile is nailed on the outside and top of box frame. It can be either plain or molded. Outside shutters are

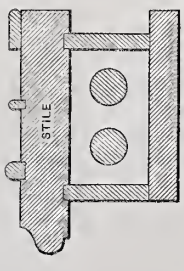
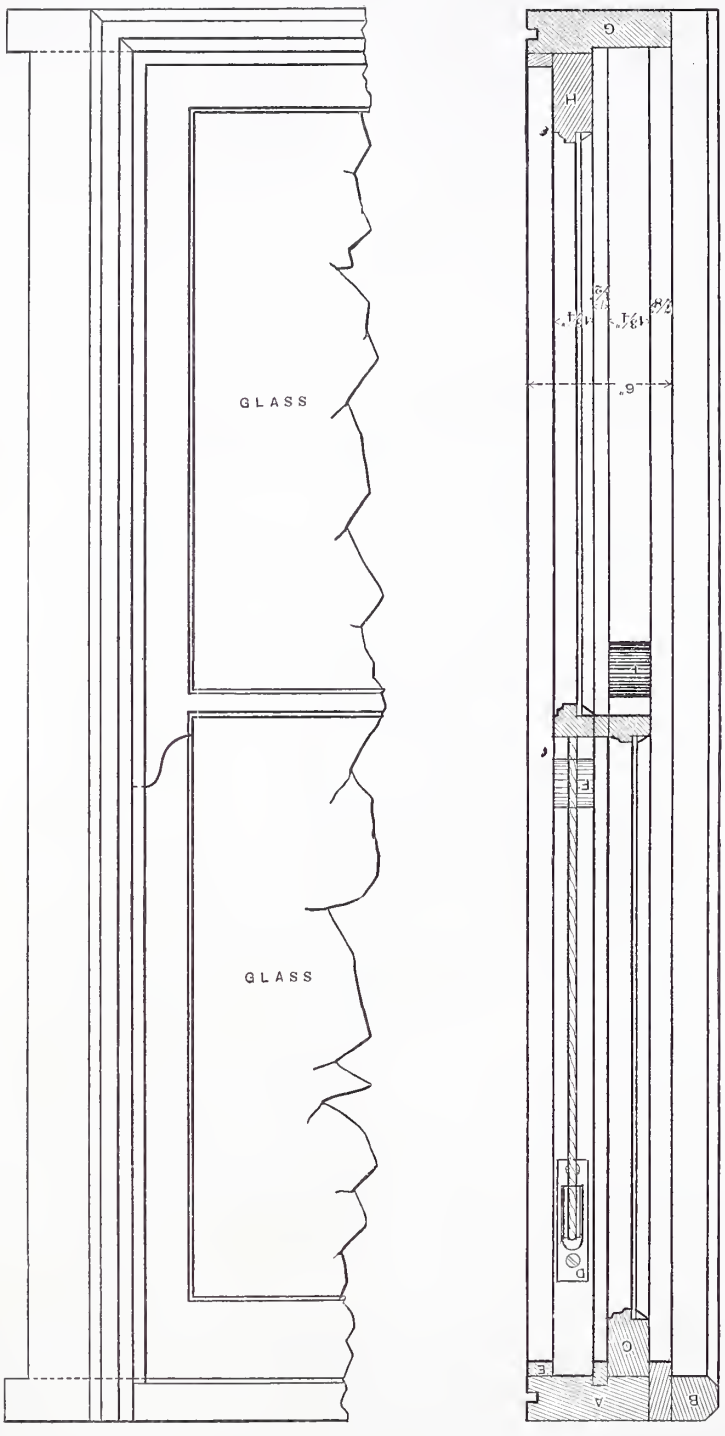


Fig. 3.—Construction of Box Frames for a Brick House.

hung to it by means of Lull & Porter's self-fastening hinges and fastenings. The ½-inch parting strip between sashes is let into the box ⅜ of an inch, so that it can be removed when the outside sash is taken out. A pocket about 12 inches high is cut in the bottom of the run of the inside sash so that weights can be put in the box. The inside ½-inch bend to hold the inner sash is screwed to the frame by 1¼-inch blued screws. A pendulum of ⅛ or ¼-inch stuff is hung in the box from the top and to within 9 inches of the bottom, to prevent the weights rubbing against each other.



Construction of Box Window Frames.—Fig. 4.—Elevation and Section of Frame.—Submitted by T. A. R.

The sash is balanced by two cast-iron or lead weights, one on each side, the sum of the two attached to the sash being equal to the weight of the sash after glazing. The cord generally used is "Silverlake" quarter-inch plaited cotton sash cord, and works on a 2-inch iron axle pulley placed where shown. Lugs on the top of lower sash, used on the bottom of upper sash, prevent breaking the glass by keeping the sash from striking the outside shutter trimming on the sub-sill, and sash locks from breaking by striking head piece. Referring to the sketches, A represents the head piece, B the hanging stile, C the outer sash, D the axle pulley, E the inside head, F lugs, G sub-sill, H inside sash, I parting strip.

From B. S. H., *Cooksville, Wis.*—The correspondent who inquires about box frames will find plans and profiles of the manner of constructing such articles in many of the pamphlets published by the manufacturing shops which furnish building material. For wooden buildings I never make a box frame, for I find that it is just as well to set the window studs so as to give about 2 inches space between the stud and jamb casing to window frame. Of course, it is necessary to saw out a pocket piece and put in pulleys before the frames are put together.

The Ten House Plans.

From S. P. R., *Grand Rapids, Mich.*—I would like to say to that Worcester critic that the reason he could not see the roof over the dining-room bay-window of the set of plans No. 69 was because he did not take the trouble to go up in a balloon and look directly down on it. If he should view the roof from this point of observation, I can imagine his surprise at not seeing any bay-windows at all.

From G. H. M., *Bloomington, Ill.*—A. D. M., of Worcester, Mass., in criticising the ten house plans published in the February number of *Carpentry and Building*, shows

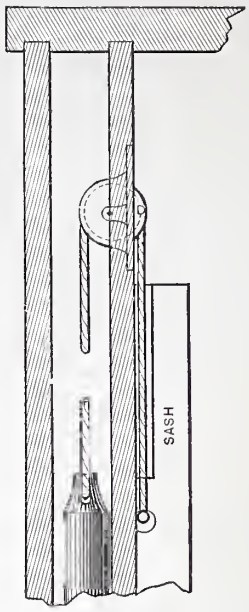


Fig. 5.—Vertical Section Through Box, Showing Pulley, Weight and Attachment to Sash.

his general ignorance when he mentions the bay-window roof of No. 69. He ought to step down and give way to someone else.

From M. P. S., *Baltimore, Md.*—Since *Carpentry and Building* professes to be a practi-

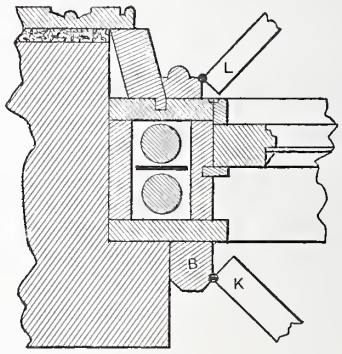


Fig. 6. Horizontal Section Through Frame in Brick Wall.

cal paper, would it not be well to hint to A. D. N. and others of his class, that funniness and sarcasm are very rarely either wit or

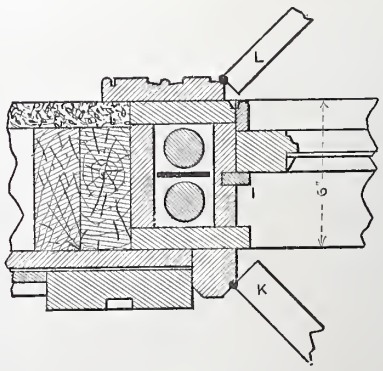


Fig. 7.—Horizontal Section Through Frame in Frame House.

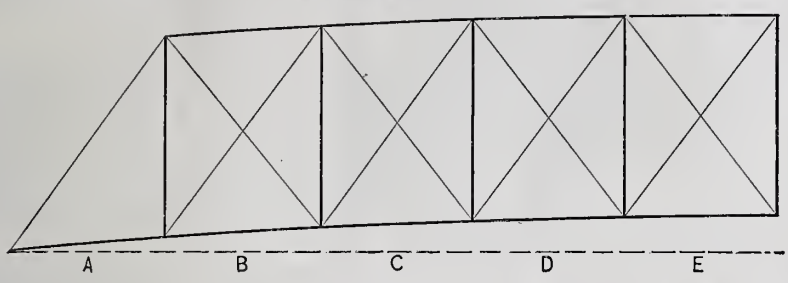
evidence. Earnest writing are what we all want. We will rely on Josh Billings and other professional humorists for such as we require of the opposite kind.

Camber in Howe Trusses.

From H. McG., *Journeyman Carpenter.*—There is a tradition that when Noah was building the ark some of his specifications were very much like some of the modern architects, a little foggy. A tony, swell sub-contracter one day approached and reproached him for misspelling a Hebrew technical word. Noah knocked the ashes out of his pipe, took the quid out of his cheek and hung it on a 40d. nail, spit on his hands, smashed the "sub's" shiny plug hat clean down on his ears, gripped one hand on his paper collar, the other in the—usual place, fired the sub through the one window, and, as he let him "gopher" into space, spoke in his left ear thusly: "I wouldn't give a continental d—n for a man who couldn't spell a word more than one way." The moral of which is for the "bridge gangs." When the three-line squib which appeared in the February number was written, Trautwine, edition 1872, pages 302 and 303, was open on the end of the bench on which I wrote, and I really suffered under a three-cornered mental delusion—that I thoroughly understood that awful, mysterious camber in all its beauty, subtlety and true inwardness, and the squib accomplished fully what I expected it would do, raise a d—l of a row among the bridge professors. About all of them I have ever known are about on a par with the stairbuilders—are generally learned out; know all there is and more. A job that isn't done their way can't be did, and the bottom would fall out of the earth, and things go to everlasting smash generally, if a bridge was built or a stairs put up not in strict accordance with the books and tradition. Geometry will cease and science die when they peg out. If they will adjust carefully on the "bridges" of their nose a pair of strong magnifying specs, and read the article carefully, it reads thusly: "It is framed in, by lengthening each brace and counter-brace enough to make the chords segments of nearly flat arches." That was all. It doesn't state that it could be framed no other nor twenty other ways, but simply it is framed that way; and it brought out information that but for that article would have slumbered in secret forever to many. It brought the bridge gangs to the front with a tramp as sure and steady as that of a mule toward a peck of oats. There are too many to notice in detail. V. A. P. says: "The truss described by H. McG. would camber down as well as up." C. says: "He shot off his mouth, and then proceeded to fire away in the dark with regard to lengthening braces and studs. He neglected to state one important feature, that is, whether the braces are to be lengthened as they approach the center or ends of the truss. I hold that the braces shorten as they approach the center." W. G. C. says: "Camber is framed in a Howe truss by either making the panels longer on the top chord and lengthening the diagonals, or by shortening the panels on the lower chord, &c." C. carefully forgets to state the exact difference between lengthening the panels on the top chord or shortening them on the bottom, or how he can do either without lengthening the diagonals. Will S. J. C. please inform us how he can produce a camber by "shortening the counter-braces gradually as you approach the ends," when his panel points are equal and his truss framed in the orthodox manner? This is a nice lot, the whole of them, conclusive, egotistical, a specimen of bridge-gang know-it-all-itiveness, can't-spell-a-word-more-than-one-way style, that is very cool and refreshing with the thermometer at 98° I am not a bridge professor, and candidly state that it was not my intention to elucidate all the secrets, arts and science, nor to write a full treatiso on bridge building in three lines. V. A. P. is dreadfully "afeared" that a truss with lengthened braces can "camber down" as well as up. My dear fellow, so it can, so it can; it is only a question as to whether you know how to do it or not, and if you and the other dear fellows won't tell any body, "Mickey" will tell you how to do it. Now, just flop your ears forward and listen. You can frame it with all the braces and counter-braces one length; with all the braces one length and the counter-braces shortest at the ends, longest in the center; with all the main braces longest at the ends, shortest in the center; with all the main braces longest at the center, shortest at the ends. You can frame it in all these methods and it won't camber down worth a cent. You can frame it any way you please, if you only know how, and when properly framed, any of those ways, even the most scientific bridge-gang professor can't make it camber down, when framed to camber up, when "screwed" to its place. You can frame a truss to screw up, screw down, or so the "Old Harry" himself can't camber it either way; to break at the center, at any intermediate point, or, if you have extra good luck, may not break at all, just as you bridge professors choose, as you know all there is worth knowing, you know, after framing one bridge.

Suppose, for the fun of the thing, that we hunt this "camber down" business with a "lengthened brace." But before we start I want to tell you that I fully expect the usual howl, "That isn't in the books; that isn't the way we do it; that isn't a Howe truss; that isn't the way Old Howe did it," and sich. But we are after the "camber down" right here, and don't care a continental how anybody does it, only, can it be done? The sketches are a little exaggerated in the camber, so you can see it. In the figures all the chords are supposed to be parallel. In Fig. 1 the panel points are spaced alike, the main braces are longest in A, and gradually decrease in length to E. In Fig. 2 the panel is shortest at A, increases gradually in regular proportion to E. The main braces are exactly the same length throughout. If the panel at A was slightly shorter, at E a little longer, and divided in proportion between, the main brace at A would be the shortest, and the braces would gradually increase in length to E, which would be the longest brace. In Fig. 3 the panel at A is shortest, at E longest, the bolts radiate to the center of the arch, the brace at A is shortest, gradually increasing to the longest brace at E, and, while it may seem a little queer, in all the cases the counter-braces are longest in the center and shortest at the ends in all the figures. Now, doesn't that strike you as being pretty plain? The usual yell is now in order about "more work than our way, nonsense, no science," &c. My dear bridge gangers, if you ever frame a truss in either of the above methods, and, if possible, frame it right and set it right side up on the abutments, I would confidentially advise you to contract the job out of screwing it until it cambered down; you'll break your company if you attempt it by the day. Some day some of you chaps will catch a Pauli truss to frame, and then you won't frame your braces and counter-braces all of one length, and cut by oue pattern.

As to the advice to buy a book and study up, thanks; so I will when my wages are raised a "pint." If you have any old oues that you are through with send them along, they will be gratefully taken in and studied. I was always short on book-larning, and am always ready to submit to the dictation and instruction of any bridge ganger who frames trusses by tradition and the books, and don't know which way a brace should lengthen to make a truss camber up. To V. A. P. I would like to hint gently that Mickey's boss was not a bridge professor, wasn't a scientist, never joined a bridge gang, never framed a Howe truss, didn't kuow the trade in all its branches, but did know a Howe truss wouldn't camber down when properly framed to camber up, and he didnt learn me anything he didn't kuow. There are some very smart men in this world, and if three or four of 'em should happen to die on the same day, this end of the earth would tip up about a foot, and the vacuum formed by their absence would make a hole that would create a hurricane big enough to destroy the "blarsted country." There is a professor in the Stevens Institute. at Hoboken, which his name is Mr. De Volson Wood, who has a reputation outside of the bridge gangs of knowing something about a truss bridge. In 1873 he published a treatise on bridges, and on page 149 he says: "Camber may be accomplished in various ways. Having determined the length



Camber in a Howe Truss.—Fig. 1.—Diagram Showing Panels Spaced Equally. The Main Braces are Longest at A, and Gradually Decrease Toward E.

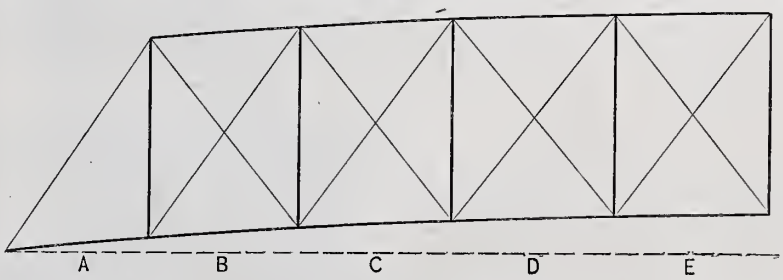


Fig. 3.—Diagram in Which the Panels at A is Shortest, and at E Longest. The Bolts Radiate to the Center of the Arch.

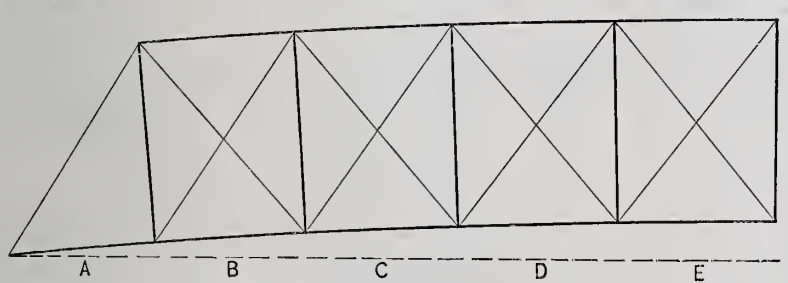


Fig. 2.—Diagram of a Howe Truss, showing the Panels Shortest at A, and Gradually Increasing in Regular Proportion Toward E.

of the main braces for straight chords, if their length be slightly increased, beginning with nothing at the center and increasing gradually toward the ends, any desired camber may be secured. This will give an arch form." But he never belonged to a bridge gang, and both he and his book should be promptly suppressed, as such teachings as these will, after a short time, upset and destroy the whole science of orthodox bridge-gang framing. As the bridge gangs seem to take great interest in my "eddication," won't some of them figure out for me how many pounds of weight is transmitted through the top chord from the first main brace to the plumb post in a regulation Howe truss, and how many pounds is transmitted through the plumb post to the abutments? What is the uso of the two or three counter-braces in the panels nearest the abutments in a long span truss? Whether it wouldn't be better construction, a better distribution of material, to make the end panels shortest, gradually increasing to the center, as Figs. 2 and 3, when the braces and counter-braces are each of one uniform size, as is usual in wood construction? only in this case they couldn't be of "one uniform length framed by one pattern," without the bridge gangs learning their trade all over again. There seems to be a solemn, awful mystery, mighty, impenetrable, unfathomable, about framing a bridge; a secret so heavy that it makes a bridge man prematurely old in carrying it, for fear some of it might get away and he not know it. Bridge and stairbuilders, in their own opinion, are born, not made. What they don't know has not been found out, and when I get more wages I'll buy some books, study up, and join 'em both, bless'd if I don't.

STRAY CHIPS.

MR. FRANCOIS LAPOINTE, of St. Laurient, Canada, is the architect of the additions and extensions recently made to the Roman Catholic College at that place, conducted by the Fathers of the Holy Cross. The building is a substantial edifice of gray limestone, and is of the Gothic order of architecture. Two new wings, 128 by 62 feet in size, have been added, and two stories placed on the old building, which is now covered with a mansard roof. The whole is crowned with a tower and light steeple. The superficial area covered by this building is 33,000 square feet. The improvements have cost $110,000.

WE HAVE RECEIVED copies of the floor plans and a brief description of the Gramercy family hotel. This building will have a frontage on the park of 63 feet, and on Twentieth street of 125 feet, and is to be nine stories high. The first story is to contain the general dining-room and three suites. From the second story to the eighth, inclusive, there will be four suites of apartments on each floor. The building will be provided with one elevator, two dumb waiters and two back stairs for servants. The edifice is in the Rennaissance style of architecture, the first and second stories being of stone, and those above the second story being of brick, with stone and terra-cotta trimmings. The building will be heated throughout by steam, and is expected to cost, when completed, $350,000. George W. DaCunha, of No. 11 Broadway, is the architect in charge.

ACCORDING to the London *Builder* the houses that are at present being built in Paris are intended to last practically for all time. They are built of solid stone and iron throughout, with foundations that resemble Roman work, on the traditions of which, by the way, they are built by the sturdy Southern workmen. Commercially these investments prove successful, and household property, so far from being a drug in the market, is at a premium. By judicious division into flats every inch of space is utilized.

PLANS WERE FILED in the Bureau of Buildings a short time since for the erection, by the Washington Building Company, of this city, of an office building on Battery Place, between Broadway and Greenwich street, to cost $900,000 The structure will have a frontage of 171 feet 9¾ inches on Broadway, 97 feet 3 inches on Greenwich street and 104 feet 8 inches on Battery Place. It will be 11 stories high.

THE RICHARDSON SAW WORKS, Newark, N. J., have for a short time been somewhat behind orders, for lack of a complete assortment of goods. This difficulty, which has caused some complaint from readers of this journal, is now about removed by increased manufacturing facilities just added.

F. B. AUSTIN, of Carthage, N. C, is engaged upon one of the finest residences in the eastern part of that State. The owner is Mr. G. C. Graves The same builder has recently finished drawings for a residence for Mr. H. Ragger.

GRANVILLE, OHIO, is experiencing quite a boom in the building business this season. A Baptist church, costing $40 000, to the design of Mr. Yost, architect of New York City, is being built by Messrs. Garber & Vance, of Newark, Ohio, contractors. The same builders have also in hand a residence costing $7000. A Methodist church costing $20,000 is about being commenced.

A MUSEUM of architectural sculpture, the formation of which was originally suggested by the late M. Viollet le Duc has been opened in Paris. The object of this museum is to afford an insight into the decorative architecture of successive periods in France from the eleventh to the eighteenth century, and to allow the student to trace the progress of his art from the earliest times until the birth of the various French schools of architecture.

A NEW BUILDING for the Homeopathic Medical and Surgical Hospital and Dispensary, of Pittsburgh, is in process of erection. The plans and specifications were prepared by Mr. John W. Barr, architect. The contract has been awarded to Mr. Robert McKain, of Alexandria, the price being $106,835. The work is to be completed by the first of October next. Mr. Jos. D. Weeks, of Pittsburgh, is the secretary of the building committee.

THE UNIVERSITY CLUB, of St. Louis, finding its present quarters too contracted for its requirements, have leased the upper portion of the Eugene Joccard building at the northeast corner of Olive and Fifth streets, and is making extensive alterations to adapt it for use under the direction of Mr. T. B. Annan, architect. The location is central, and the building is well adapted to its use as the headquarters of a wealthy and elegant club.

PLANS FOR a new hospital building to be used in connection with the St. Vincent's Hospital, this city, were recently filed in the building department. The building is to be four stories high with a front of brick and Bellville stone, and to have a mansard roof. The cost of this building is estimated at $150,000. The architect is Mr. William Schiekel.

THE NEW OLYMPIC THEATER, St. Louis, is making rapid progress, and bids fair to be finished in time for the opening of the dramatic season in the fall. The front, on Fifth street, is of the light-colored Indiana limestone, elaborately ornamented with intaglio and relief carving. It is already complete up to the fourth floor. Two stories more are to be added, and the whole will be crowned with a heavy and elaborate cornice of galvanized iron. The street front will be devoted chiefly to stores on the ground floor, and to offices above, the the theater proper occupying ample space at the rear. Messrs. McElfatrick & Son are the architects.

THE NASHVILLE AND EDGEFIELD MFG. CO., of Nashville, Tenn., are about to erect a five-story brick building on George street, near Cherry, that city. The building business in Nashville at the present time is brisk. Numerous other buildings, large and small, are in process of erection.

SOME ANXIETY has been recently caused by the report that the exterior walls of the famous Cooper Union Building were cracking. It is a fact that every lintel on the Third avenue side of the building is cracked in several places, while the alignment of the ashlar course beneath the third story is almost as irregular as the waves of the sea. While this condition of affairs has been in existence for some time, the effect on those who had their attention called to it may be imagined. The building department, on being interviewed, reported that the condition of the building had been known for some time, and that the defects related only to the exterior shell of the building, which was built independently of the interior, and, if necessary, might fall away and not affect the interior at all. The cause of the cracks is variously stated, some attributing it to defective foundations, owing to the presence of sewers and water pipes, and others to the fact that additional stories have been put upon the building since the edifice was erected.

MR. C. E. PARCELL, of Tampa, Fla., has recently completed plans and estimates for rebuilding old Fort Brooks. Building prospects are encouraging in the locality named. A number of private residences are in progress and contemplation.

THE CORNER STONE of the new court house at Anderson, Ind., will be laid on the 17th of August.

A COMPANY, known as the United States Cremation Company, with a capital of $50,000, has recently been organized, and is composed of well-known citizens of New York and Brooklyn. These gentlemen have determined to erect a handsome crematory on the Boulevards, not far south of 105th st. The design is said to exhibit rare skill in treatment, and the building, when erected, it is promised, will present a very imposing and unique appearance. The object of this company is to make a regular business of the incineration of the dead. The use of the proposed crematory will not be confined to the stockholders of the company, but will be open to the public at large.

MR. R. B. BULLOCK, the well-known dry-goods merchant, of St. Louis, is building a new store on Franklin avenue to accommodate the growing trade of this part of the city. It will front 45 feet on the avenue, the lower portion to be of iron, the upper stories of the Warrensburg sandstone. Mr. C. E. Illsley is the architect.

THE OLDEST CHURCH in New York State is in Tarrytown. It is built of stone and brick, the latter having been imported from Holland for the express purpose. It has an antique belfry, high windows, placed above the range of Indian arrows, and hipped roof.

THE VERY LARGE building for the Produce Exchange, now in course of erection on the Bowling Green, at the foot of Broadway, this city, will be an iron structure faced with stone. Floors and supports, reinforced by brickwork in the usual manner, are to be of iron. This edifice will bear witness to the usefulness of iron in architecture, notwithstanding the objections of architects to its use when it first began to be extensively employed and to the renewed disfavor into which it has fallen in comparatively recent years.

ALTHOUGH BUILDINGS are going up in all parts of Chicago, yet the number would be very much greater were it not for the high price of material and the uncertain attitude of the labor element.

THE VANDERBILT FAMILY MANSIONS have done much in causing a break in the type of house which was formerly considered the most fashionable in New York. Hereafter wealthy people, when a home is projected, will prefer a design which has some features about it distinguishing it from its neighbors.

THE NEW school building at Pullman, Ill., will be ready for occupancy by September. The walls are up as high as the first story, and are of pressed brick. The structure is to be 120 x 70 feet and three stories high, with a seating capacity for 700 children. It will contain 12 rooms, each to accommodate 54 pupils, and will be built in the Gothic style of architecture.

SOME MONTHS AGO the railway companies of St. Louis announced their purpose to select a new location, and to build a new union depot better adapted to their business and more creditable to themselves and to the city than the present shabby structure. Negotiations have been in progress for some time for the purchase of ground for this purpose. At last the announcement is made that the whole project is to be abandoned, and an additional story built on the present depot. Perhaps the views of property owners were deemed too high by the railway officials who were charged with selecting a new location.

THE REALLY SPLENDID dwelling house of the future in New York City, whether for single persons or to accommodate a number of families, will, in all probability, be erected along the Boulevard, Riverside Drive, Eighth Avenue and on the hights west of Morning Side Park. They will, in all probability, be laid out with winding walks under shade trees, and will have room in the openings for ornamental plants. A few prosperous years with a growing population will, no doubt, lead to the erection of some costly dwellings in the locality pointed out.

MR. GEO. B. F. COOPER, architect, of Lima, Ohio, has prepared plans for a new schoolhouse now being built in that place, at a cost of about $15,000. He has also prepared plans for two dwellings, costing $4000 each, and is at work upon the drawings for a new city hall to be erected in that place.

A NEW county court house is in progress at Lima, Ohio, the estimated cost being $150,000. Mr. George B. F. Cooper is the local superintendent.

DURING THE six months ending June 30, the Building Bureau of this city approved plans for 1365 new buildings, estimated to cost upward of $26,000,000, and 1998 alterations to cost upward of $2,700,000. During the same six months, the Brooklyn Building Bureau approved plans for new buildings to cost $4,800,000, and for alterations to cost $446,000. From this it will be seen that the building business in the first half of the present year in New York and Brooklyn amounts to more than $34,000,000.

WORK UPON the new court house at Fond du Lac, Wis., has been rather slow of late, owing to the delay experienced in securing the necessary brick and iron.

FAR MORE BUILDING of costly structures is going on in Buffalo, N. Y., than in any previous year in the city's history.

THE PULLMAN COMPANY have decided to build themselves a first-class office building on the corner of Adams street and Michigan avenue, Chicago. It will be 100 x 180 feet, and will be nine stories high, with a stone front.

SAMUEL J. TILDEN has been for some time engaged in remodeling his residence in Gramercy Square, this city. The building is well worth a visit on the part of architects and students of the builder's art, on account of the many novelties which are being incorporated in the way of adornment.

THE RECENTLY issued statistics of the Building Bureau of New York, indicate that there has been a decline in the remarkable activity of building operations which marked the preceding six months as exceptional. The decline is especially noticeable in first-class dwellings, and also in that class of tenement property which includes stores. The statistics show that the popularity of apartment houses and of flats of the English and French style has increased, and that over $3,000,000 more was invested in the flat buildings than was expended upon such structures during the first six months of last year. The labor strikes have operated to deter building activity to a considerable extent, and the bureau authorities are of the opinion that when the labor difficulties are arranged the building will progress as steadily as during last year. During the six months 3 new hotels were built at a cost of $80,000, and 228 tenement houses were put up at a cost of $2,769,950. The first-class dwellings numbered 217, and cost $6,480,200. The tenements with stores numbered 106, erected at a cost of $2,026,800. The flats numbered 322, and were erected at a cost of $8,455,000. During the same period there were also built 45 factories, 5 schools and colleges, 10 churches, 14 public institutions, and 69 frame buildings. Altogether, there were 1260 new buildings, comprising 17 different styles, erected, representing an investment of $27,909,305 capital. This is a decrease of over $1,000,000 on the amount invested during the same period in 1881.

THE REIGN of the brown-stone front in New York City is over for choice houses. The most costly residences now being built in the fashionable quarters are of brick with stone trimmings. Stones of different colors are used in new and striking combinations. Brown stone is relegated for use in tenement houses and third and fourth rate French flats.

CARPENTRY AND BUILDING

A MONTHLY JOURNAL.

VOLUME IV. NEW YORK= SEPTEMBER, 1882. NUMBER 9

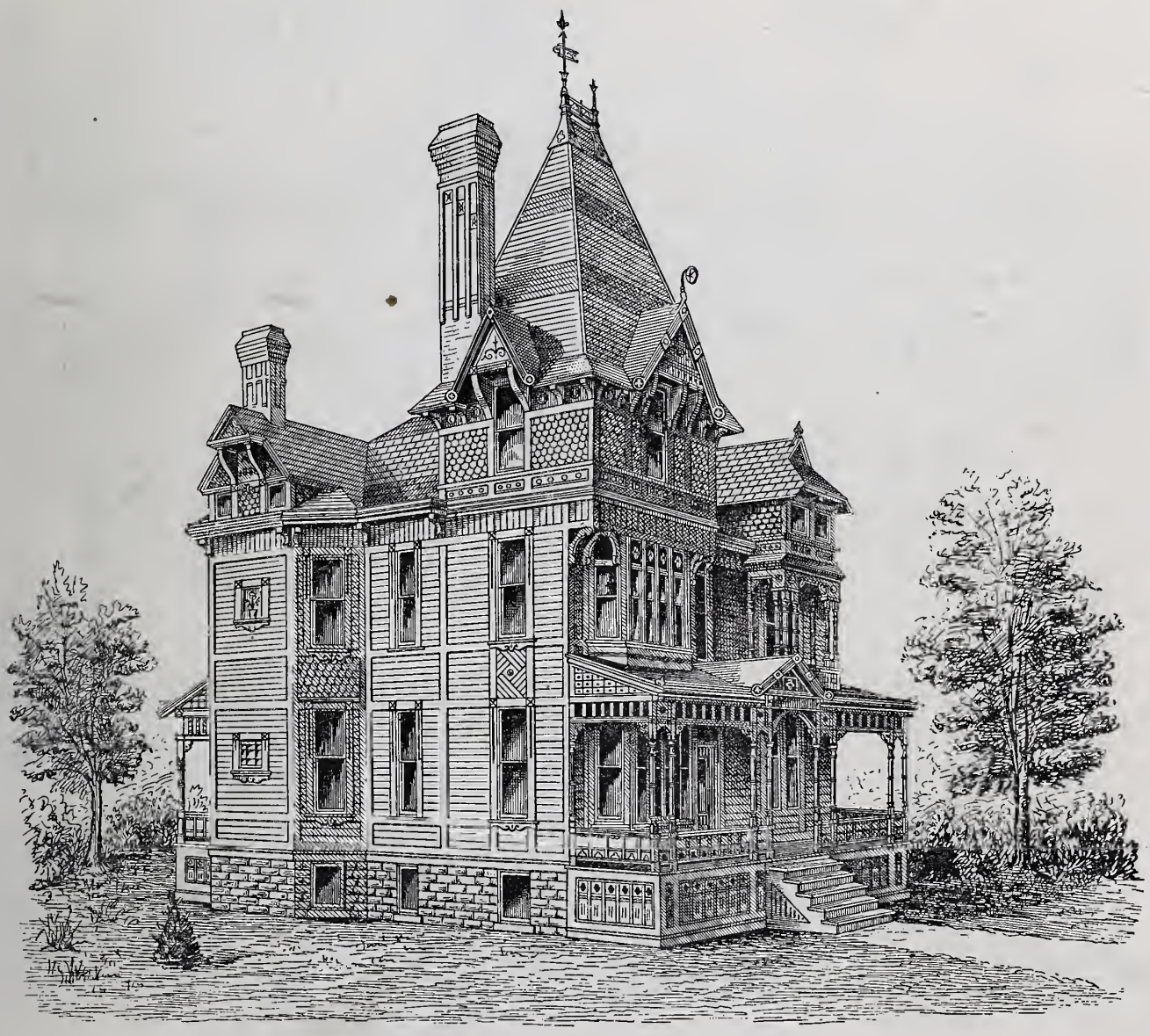
The Highest Building in Europe.

Hitherto the Hospice of the Great St. Bernard, which stands 8200 feet above the level of the sea, has enjoyed the distinction of being the most elevated inhabited building in Europe. This honor it can no longer claim. During the past year the city authorities of Catania, in Sicily, have caused to be erected near the summit of the great volcano, Mount Etna, an astronomical observatory, which stands 2943 meters above the sea level, or fully 1000 feet higher than the Hospice of St. Bernard. The structure is 9 meters high, and covers an area of 200 sq. meters. It consists of an upper and lower story, and is built in a circular form. In the lower story there rises a massive pillar, upon which is placed the great refracting telescope. The lower story is divided into a dining-room, kitchen, and storerooms. In the upper story there are three bedrooms, intended for the accommodation of astronomers and tourists visiting the establishment. The roof consists of a movable cupola or dome. From the balconies of the upper story a prospect of vast extent and grandeur is presented. The spectator is able to see over half the island of Sicily, the island of Malta, the Lipari Isles, and the province of Calabria, on the mainland of Italy. The observatory is erected upon a small cone, which will, in the case of eruption, protect it completely from the lava-stream, which always flows down on the opposite side of the volcano.

The ancient temples of Egypt are believed to contain the oldest timber in the world, in the shape of dowel pins, which are incorporated with stonework known to be not less than 4000 years old. These dowel pins, from their appearance, are supposed to be made from the tamarisk of shittim wood, in ancient times a sacred tree of Egypt.

Second Prize Design in the Sixth Competition.

We present herewith a perspective view of the design submitted by Theodore A. Richter, Jr., Cincinnati, Ohio, to which was awarded the second prize in our sixth competition. On following pages will be found the elevations, roof and attic plan and details. The hights of the different stories adopted in this design are 11 feet for the first story, 10 feet for the second story, and 9 feet for the level ceiling of attic, as marked by the dotted lines on the attic plan. From these lines the attic slopes down with the roof. The tank room in the attic is dropped 18 inches below the attic floor, making the ceiling of bathroom and sewing-room only 8 feet 6 inches high. The object of this construction, as pointed out by the designer, is to obtain a higher tank. The other features, to which the designer directs attention, are as follows: A cedar closet is obtained on the landing of



Second Prize Design in the Sixth Competition.—Fig. 1.—Perspective View.—Theodore A. Richter, Jr., Architect, Cincinnati, Ohio.

attic stairs by making the ceiling of closet in the front second story chamber to suit the same. The roof is arranged so that the rear spout drains direct from the gutter into the tank in the attic, the tank being provided with an overflow to the rear down spout. The architect's intent in this construction was to provide a slip joint between the spout and the overflow, so that the water may be drained directly from the gutter to the rear down spout in case the tank is full. The mantel in the dining-room was designed for a small window with ornamental glass over the shelf so as to obtain an outlook on the side street. In point of construction the designer had in mind sheathing the entire exterior on the studs, over which he would lay a layer of thick asbestos felt. Upon this, in turn, there would be placed dressed weather-boarding and shingles, as represented in the elevations. The chimneys are constructed of ornamental brickwork topped out with freestone trimmings or copings. The designer would have the entire interior of the building plastered, the principal rooms to be finished with stucco cornices and center pieces. A fine opportunity for the use of several kinds of wood finishing is presented in this design, the selection of which would be a matter of taste upon the part of the person building the house.

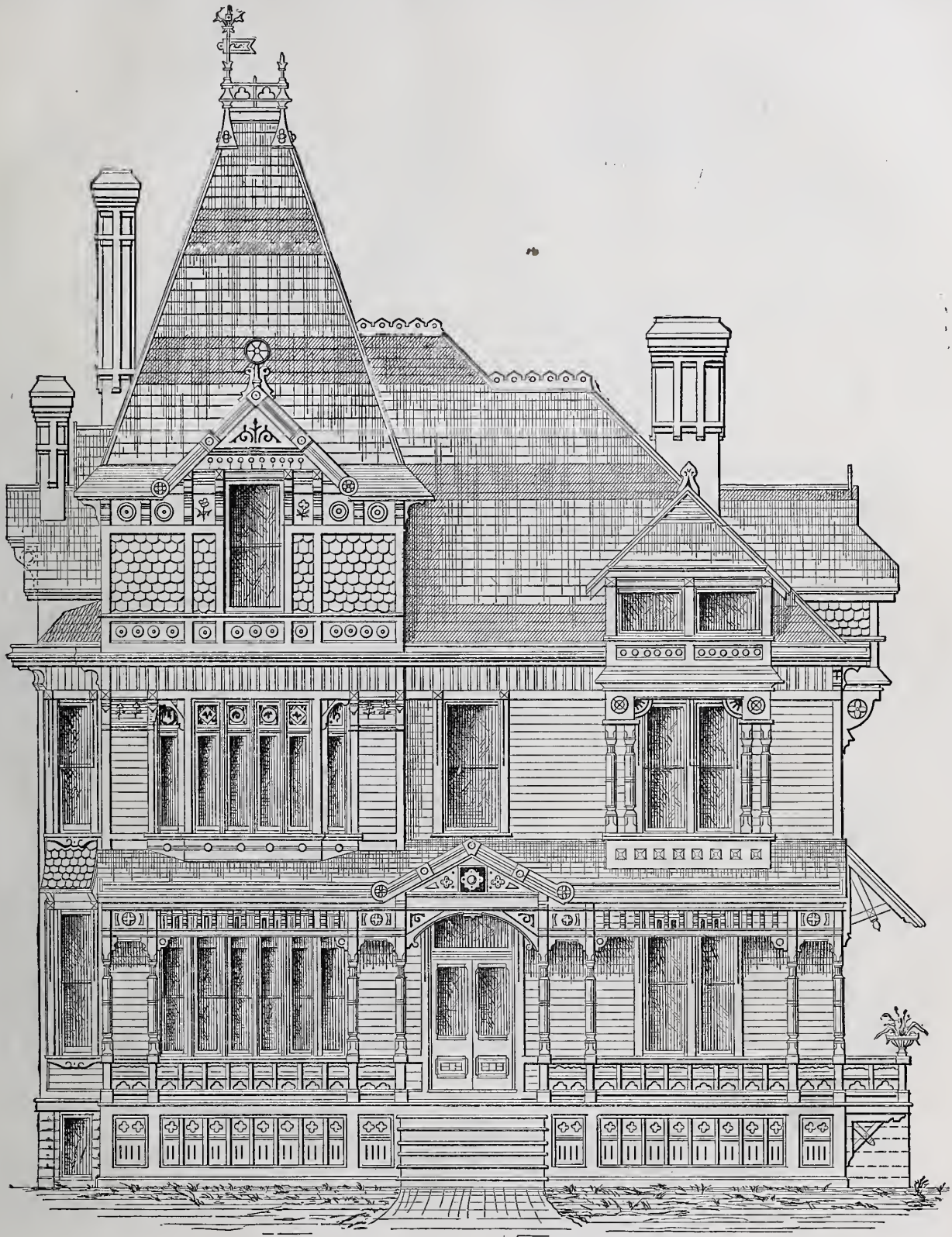
Second Prize Design.—Fig. 2.—Side Elevation.—Scale, ⅛ Inch to the Foot.

A Building Without Windows.

The Lincoln Safe Deposit Company and the Lincoln National Bank expect to occupy, by April next, their new building now in course of erection on the south side of Forty-second street, this city, almost directly opposite the Grand Central Depot. The building will be one of massive proportions, and will be chiefly remarkable among the great buildings of the city as one which is without windows in the six stories above the main floor. In the front of each of these six stories there will be two iron doors wide apart from each other. It is believed the building will contain in every essential feature all that is necessary to make it absolutely fire-proof. It is to be of brick with Belleville stone trimmings. Ex-Postmaster-General James is the president of the company. The architect is Mr. John B. Snook. The building will stand on a foundation of solid rock, and the basement where the three vaults of the Safe Deposit Company are to be located is at present being hewn out of the rock. The building will have a frontage of 47 feet on Forty-second street. The hight of the building will be 116 feet. A second building, front-

ing on Forty-first street and connecting with the main building, is also to be erected. This will be 50 feet front by 97½ feet deep, and seven stories high like the main building.

The reception rooms and business offices of the Bank and Safe Deposit Company are to be on the first floor of the Forty-second street building. There is to be no wood, except in and will be lighted from a dome. There will be no plaster used in any of these rooms, while the floors will be of baked tile. The main safe on the first floor for the use of the Bank and Safe Deposit Company will be two stories in hight. At the side of the entrance on Forty-second street there is to be a staircase leading to the watchman's room. firemen, with access to an abundance of water, will be found on each floor. In the rear portion of the main building there are to be two hoistways for the carrying of goods to the storage compartments, and an iron staircase from the top floor to the basement. On the first floor a dumb waiter for the carrying of stocks and bonds to and from the



Second Prize Design.—Fig. 3.—Front Elevation.—Scale, ⅛ Inch to the Foot.

the shape of furniture, throughout the building. The sashes of the windows on the lower floor are to be of iron. The front rooms on the main floor will be set apart for the use of the president and trustees, and for a ladies' reception-room. The partitions between these rooms will be of glass and wire. In connection with the Safe Deposit Company's offices there will be a private entrance for ladies and a coupon-room for their use near at hand. The coupon-room for gentlemen is to be in the rear portion of the main building. It will be 18 by 42 feet in dimensions, The watchman will stand on the gallery over this entrance, and will have an unobstructed view of the entrance, the safe and all parts of the main floor. The six upper floors are to be used for the storage of furniture, paintings and other property belonging to those who may secure compartments. The average size of these storage-rooms, of which there will be 23 on each of the six floors, will be 13 by 20 feet. The compartments will have fireproof brick walls and iron doors, and each will be properly ventilated by a new contrivance. All conveniences for the use of vaults in the basement will be in use. The main building will cost over $350,000. The building to front on Forty-second street will be used for the reception and delivery of goods placed in it or removed from the storage compartment. The cost of this building has not yet been fully calculated. President James says that no expense, however, is to be spared to make it like the main building—complete for its purpose.

When the carpenter would do a driving business he merely reaches for a nail.

Competition in Primary School Buildings.

Mayor Low, of the city of Brooklyn, in an effort to improve the general character of schoolhouses for primary schools in that city, offers the following prizes for designs: A prize of $250 for the best plan, with specifications, for a building to cost not over $15,000; A prize of $200 for the best plan, with specifications, for a building to cost not over $20,000, and a prize of $150 for the best plan, with specifications, for a building to cost uot over $25,000. The President of the Board of Educatiou, the Chairman of the Schoolhouse Committee of the Board, the Superintendent of Public Instruction, the Superintendent of Buildings of the Board of Education and and the Building Commissioner of the city are named as the committee to decide the contest. The conditions under which this competition are conducted are as follows: Plans are to be drawn ou white paper to a uniform scale of ¼ inch to the foot. The buildings are to be constructed of hard brick, with stone sills and lintels, the front to have stone or such other trimmings as may be deemed suitable. Separate aud complete plans and specifications are required for each building. The designs are to be submitted under *nom de plumes* or mottoes. In making awards, the following considerations will be observed: Best accommodation for the greatest number of pupils in counection with convenience of arrangement for school purposes; security and facility of egress; distribution of light; ventilation and heating; draiuage and other sanitary appointments; general construction and architectural design. Provisions for heating required for the system proposed, are to be made and shown on the plans. The cost of heating apparatus is not included in the proposed cost of the respective buildings. This competition will close on the 20th of November, and awards will be made as soon as practicable thereafter. Further particulars can be obtained by addressing Seth Low, Mayor, Brooklyn, N. Y. This competitiou is one in which many of the readers of *Carpentry and Building* could take part advantageously, and we shall be surprised if a very considerable number of plans from amoug our readers are not submitted.

Second Prize Design.—Fig. 4.—Rear Elevation.—Seale, ⅛ Inch to the Foot.

Ancient Mortar.

The following item has had very extensive circulation in the architectural and mechanical journals of this country: "Reference has frequently beeu made to the remarkable

durability of Italian mortar, and until now no satisfactory reason has been assigned for it. The London *Builder* says it is due to the fact that the lime remains in a pit covered with water for two years before it is used, whereas in England, as in this country, lime is slaked and used the same day."

Mr. Charles Heaton, of Albany, writing to the *Industrial World* concerning it, says: "Good mortar is a solid silicate of lime—that is, the lime unites with the silica or sand to form a silicate of lime. In ancient days those who had some conception of the way the two things united superintended their mixing; but nowadays anybody is supposed to know how to make mortar, while nobody knows much about it. Dry lime and dry sand laid together or mixed and kept dry for a thousand years would not unite to form silicate of lime, any more than acetic acid and carbonate of soda, dry in a bottle, would effervesce; and keeping 'the lime in a pit covered with water for two years' is no reason why good mortar may be expected from it. To make silicate of lime just as good as was made by the Romans, all that is necessary is to proceed understandingly, or as follows: Procure good caustic, *i. e.*, fresh burned lime, and if when you open the barrel you find it all powder, *i. e.*, air-slaked or carbonated, don't use it; use only the clear lumps. Slake this (and if possible in a covered vessel), using only enough water to cause it (the lime) to form a powder. To this, while hot, add clean sand (silica or silicic acid)—not dirt and loam, called sand, but sand—and with the sand add water enough to form a paste. Then let it lie where it will not become dry by evaporation—in a cellar, so much the better, for as soon as you have mixed the sand and lime as above, they begin to react, one on the other, and if not stopped by being deprived of moisture, will go on reacting until silicate of lime (as hard as any silicate of lime ever was) is formed. But, if you take this so-called mortar, as soon as it is made, and lay bricks with it, unless the bricks are thoroughly wet, you stop the formation of silicate of lime and might as well lay your bricks in mud. Lime and sand, after being mixed as before advised, might lie two years with advantage, and for certain sorts of use, such as boiler setting, or where the whole structure of brick and mortar is to be dried, the mortar ought to be mixed for one year before use, and two would be better; but for house building, if the bricks are so wetted as not to rob the mortar of its moisture as soon as used, mortar that has been mixed a month will form good solid silicate of lime *in situ*—*i. e.*, among the bricks it is laid with, in ten years, and will be still harder in a hundred years. The practice of mixing mortar in the streets and using it at once is as foolish as it is ignorant, and 'the mixing the lime with water and keeping it wet two years' would be no improvement. Silicate of lime is made only by the slow action of caustic lime and sand, one on the other—under the influence of moisture. In the dry they will never unite, and mixing mortar as now mixed and using it at once, so as to dry it out and stop the formation that the mixing induced, is wrong."

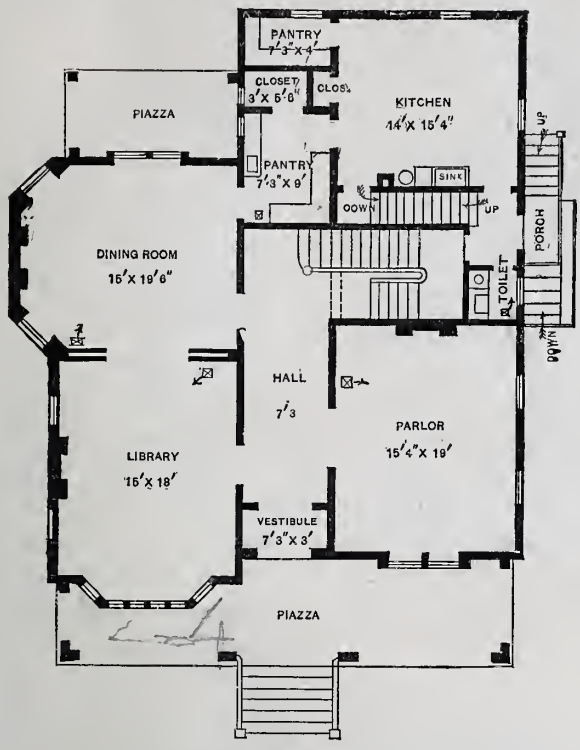


Fig. 5.—First Floor Plan.

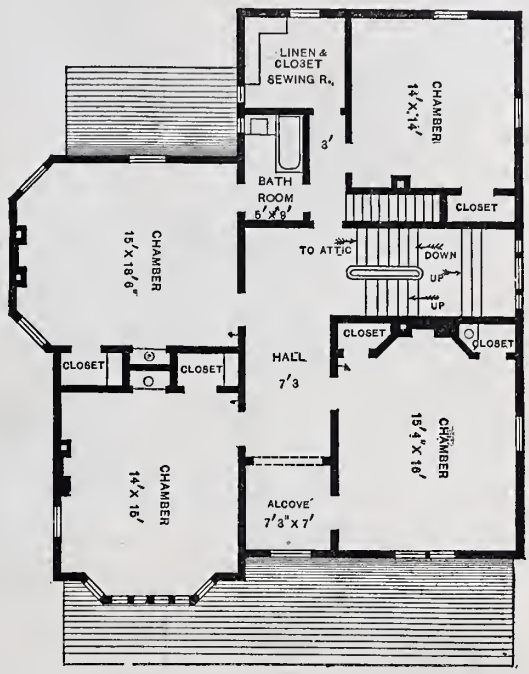


Fig. 6.—Second Floor Plan.

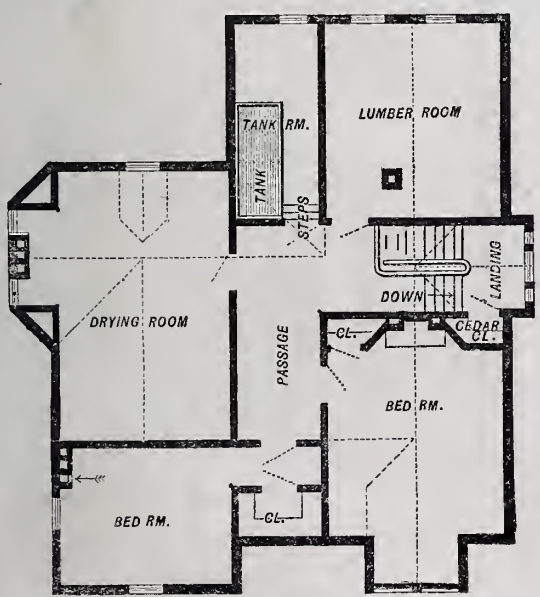


Fig. 7.—Attic Plan.

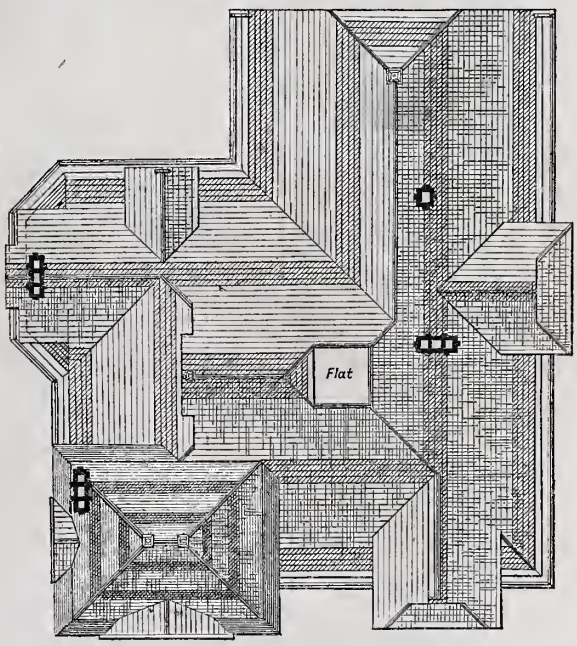


Fig. 8.—Roof Plan.

Second Prize Design.—Floor Plans, Attic Plan and Roof Plan.—Scale, 1-16 Inch to the Foot.

A Model Commercial Building.

There has been recently completed, on the Southwest corner of Franklin street and Broadway, this city, one of the choicest positions in the dry-goods center, a six-story basement and sub-cellar fire-proof store that for thoroughness of construction, utilitarian and convenient arrangement probably ranks ahead of any structure of its dimensions in the city. Mr. James L. White, of New York, is the owner. The mason work was done by Freeman Bloodgood; the woodwork was in charge of James Hardley; the ironwork was done by J. B. & J. M. Cornell; the steam-heating by Baker, Smith & Co.; the plumbing by Timothy Brien; the gas fitting by Messrs. George H. Kitchen & Co., and the elevator by Otis Bros. The building was designed and superintended by W. Wheeler Smith, architect. It has a frontage of 54 feet on Broadway and 165 feet on Franklin street. The hight above the sidewalk is 100 feet, and the depth below the sidewalk is 22 feet. The walls are a combination of iron and brick, contributing as far as possible to absolute permanency. The exterior is very imposing and may be described as a bold and free architectural treatment, exclusively practical in its consideration of the objects of its erection, light and utility. The entire structure, from the extreme bottom to the roof, has been laid in pure cement. The ironwork of the exterior is built in with brick, and the iron beams of the floors are filled in with terra cotta. The freight elevator is surrounded by a substantial wall, and the lavatory and the water-closet system are also in a separate brick inclosure in one vertical line, thus obviating all danger from water to the store. A spacious and heavy fire-proof staircase of iron and slate is also separated from the main building by a heavy wall, and is a valuable feature at the west end of the store. The sub-cellar, a feature very commonly neglected, is almost as attractive and light as the handsome basement. It is furnished with a floor of cement, of substantial thickness and a surface like stone. The boiler-room is 16 feet in hight, and is separated from the cellar and basement by a screen of iron and glass. The plumbing is exceptional in its workmanship, weight of material and choice manufacture, being selected by the architect with the aid of one of the most skillful mechanics in the city. The sanitary and precautionary measures are unusually complete. The water supply for both house and elevator use is either from Croton main or two driven wells of more than 25,000 gallons daily capacity. It is distributed by four wrought-iron tanks of an aggregate capacity of 10,000 gallons. A line of fire pipe with valve and hose outlet in each story, connected with iron tank on roof and steam pump in cellar, adds a precautionary feature to the building in the event of any fire on individual floors. The freight elevator of main shaft has a new feature in automatic patent

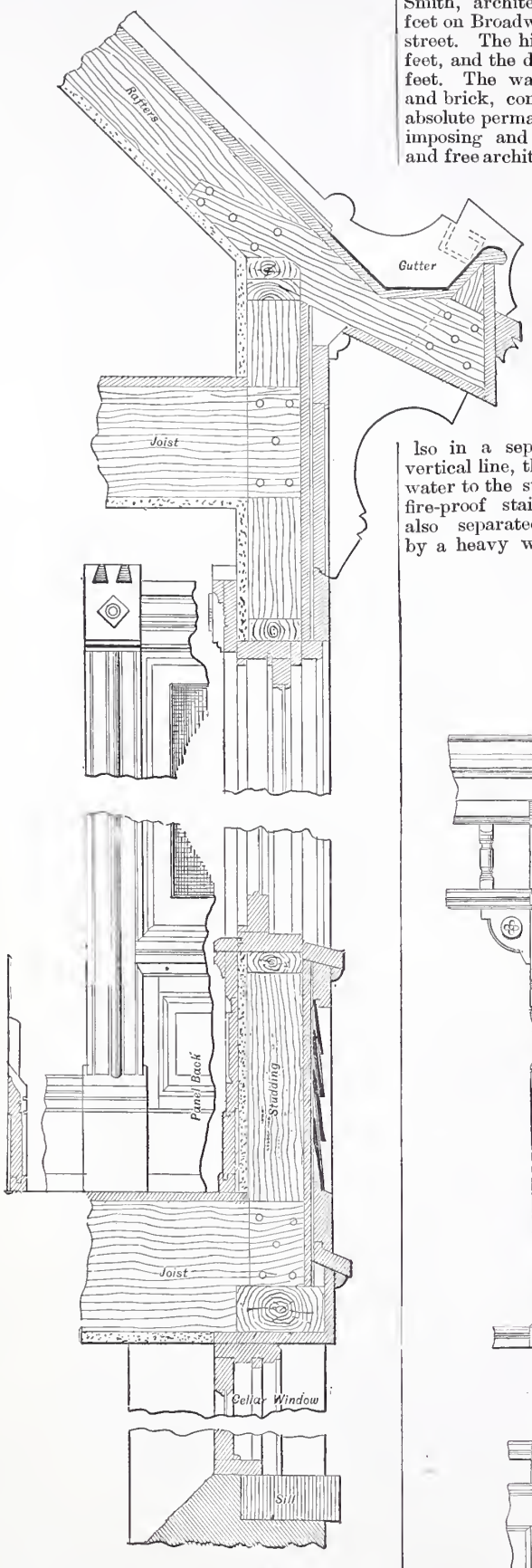


Fig. 9.—Section showing Main Cornice, Finish of Windows, Inside Trimming, Outside Finish, &c.—Scale, ¾ Inch to the Foot.

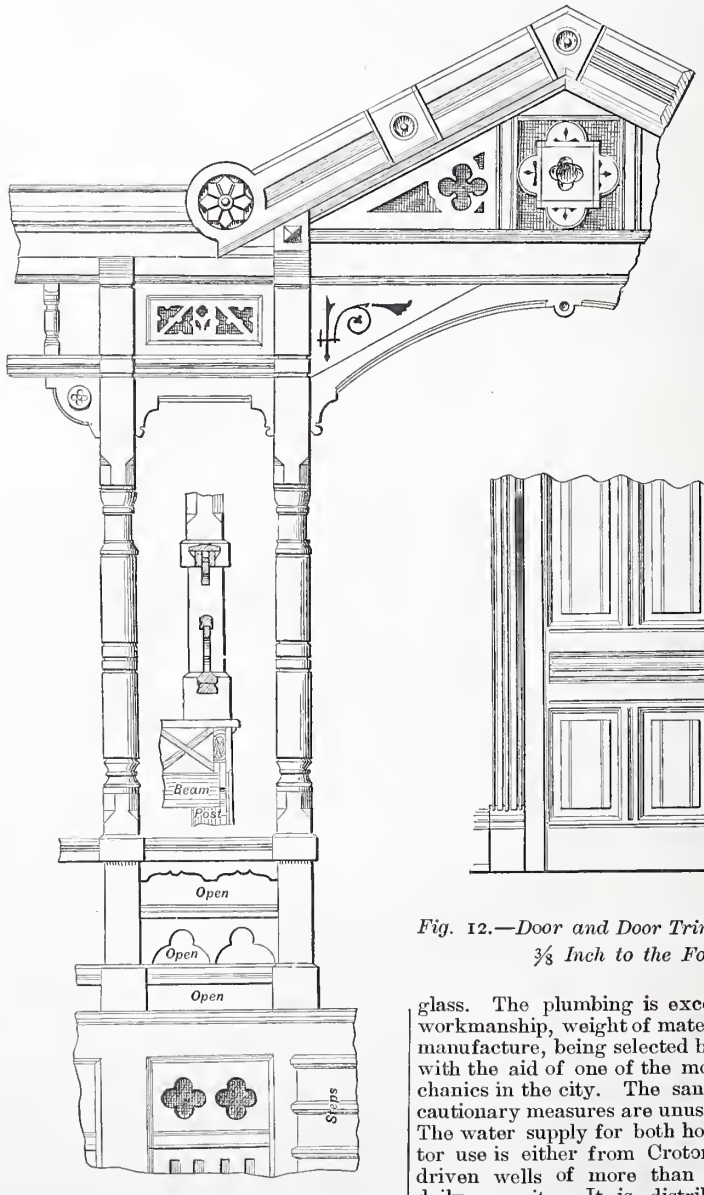


Fig. 10.—Half Elevation of Veranda Over Main Entrance and Detail of Veranda Railing.—Scale, ⅜ Inch to the Foot.

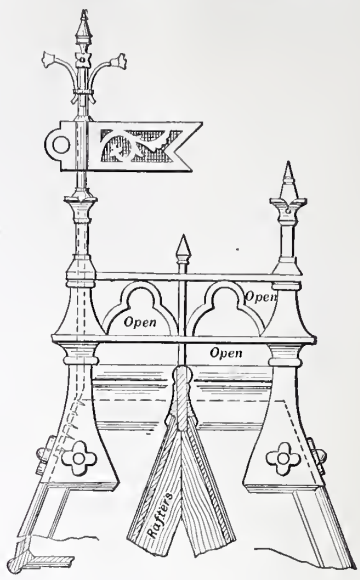


Fig. 11.—Detail of Tower Finial and Crest. —Scale, ⅜ Inch to the Foot.

Fig. 12.—Door and Door Trimming.—Scale, ⅜ Inch to the Foot.

doors, absolutely preventing accidents from open doors and controlled only from the elevator car itself.

The Restoration of Architectural Structures.

The rage of restoration which has prevailed so largely during the last half century, has been severely criticised at different times. It

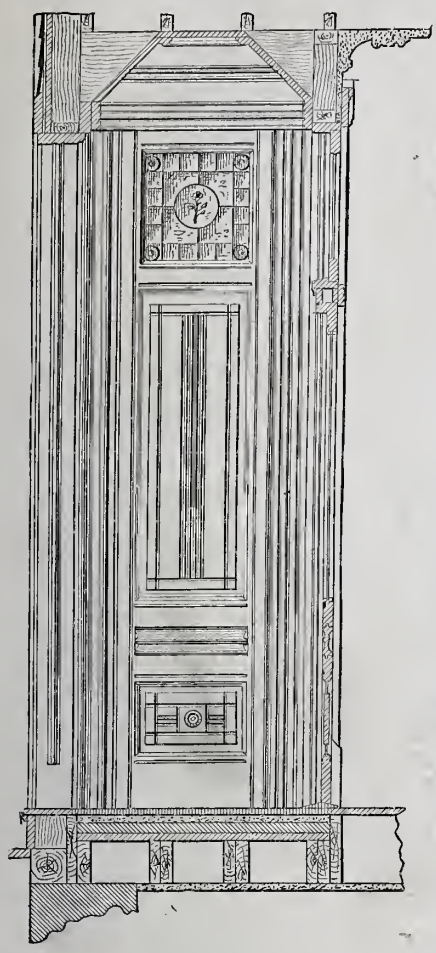


Fig. 13.—*Section of Vestibule showing Storm Door Open.—Scale, ⅜ Inch to the Foot.*

has been said that while much good may have resulted from the minute investigations and profound architectural studies to which they have given rise, our grandchildren will be unable to form any idea of the original

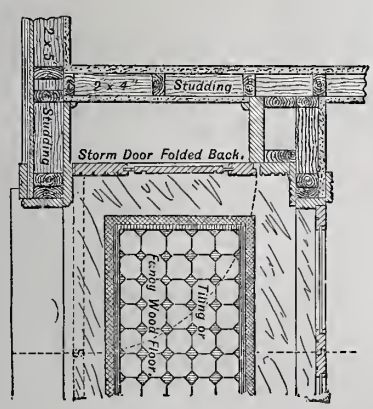


Fig. 14.—*Plan of Vestibule showing Storm Door Folded Back,—Scale, ⅜ Inch to the Foot.*

beauty of our buildings if they continue to be treated as they have been. In many cases more has been done for the destruction of noble monuments of art than had been accomplished in the preceding ages of ignorance, barbarism and devastation. When the strange and fatal idea of restoration first arose, monumental archæology was still in its infancy and had not learned that the historic and artistic importance of a building depends wholly upon the authenticity of its various parts. The idea of the restorer implies the possibility of taking from a monument some part of its life, with the sole object of representing in the building the best times in its history, or giving it a unity of style which it never had, without any other guide than individual caprice. In past ages any suspicion of falsification was removed by the fact that builders had no knowledge of preceding styles; hence, when any repairs or changes were made, they necessarily followed the fashions of the time and thus maintained a truthfulness which should always characterize the highest excellence in art.

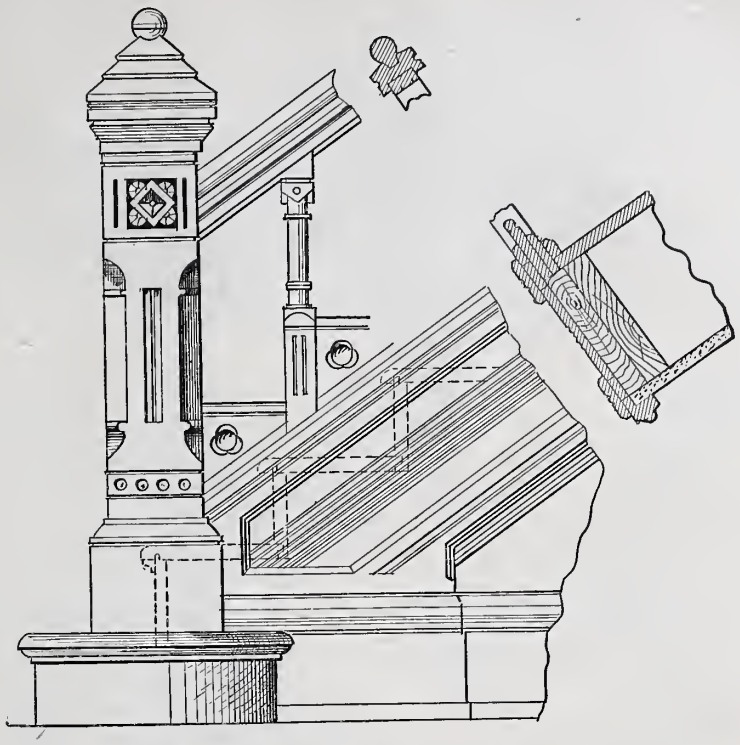


Fig. 15.—*Detail of Main Stairs.—Scale, ¾ Inch to the Foot.*

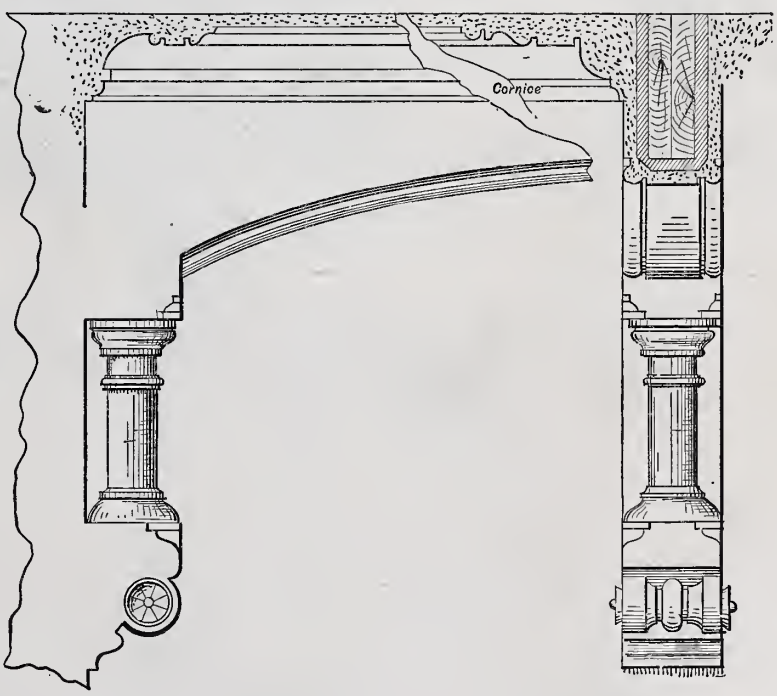


Fig. 16.—*Arch Over Main Stairs.—Scale, ¾ Inch to the Foot.*

Instruction in Bricklaying.

It is not easy to map out, in the abstract, an outline of the course which shall be most useful for instruction in bricklaying for engineering students, but some of the elements are clear enough which should form a part of such instruction. It could not be claimed, or expected, that young men should become, under any such arrangement, either familiar with the more elaborate kinds of finished brickwork or with the actual hand labor required in laying up such work. It is certain, however, that with five or six of the different elements of the art of plain bricklaying, if it may be thus divided, young men may be made familiar, not only by hearing explanations, but also by the far more useful means of actual hand-work, within a very moderate space of time.

These elements consist, in part, of the plainest form of straight wall of different thicknesses, the turning and plumbing of a square corner or an angle corner, the bonding into the main wall, and the battering out of a buttress or a pilaster, and the laying up and filling in of a heavy pier or massive block of masonry. There may be, also, very properly included the turning of arches, both in single rings and in bonded courses, of various span and rise, all involving only the

use of plain outlines, such as can be dealt with perfectly in whole brick, and in all of which a very useful quantity of work may be gone through with in a reasonable time. Nothing can show so fully to a learner the differences in materials, or in methods of using them, as an opportunity to deal with them thus in a destructive way, to see how

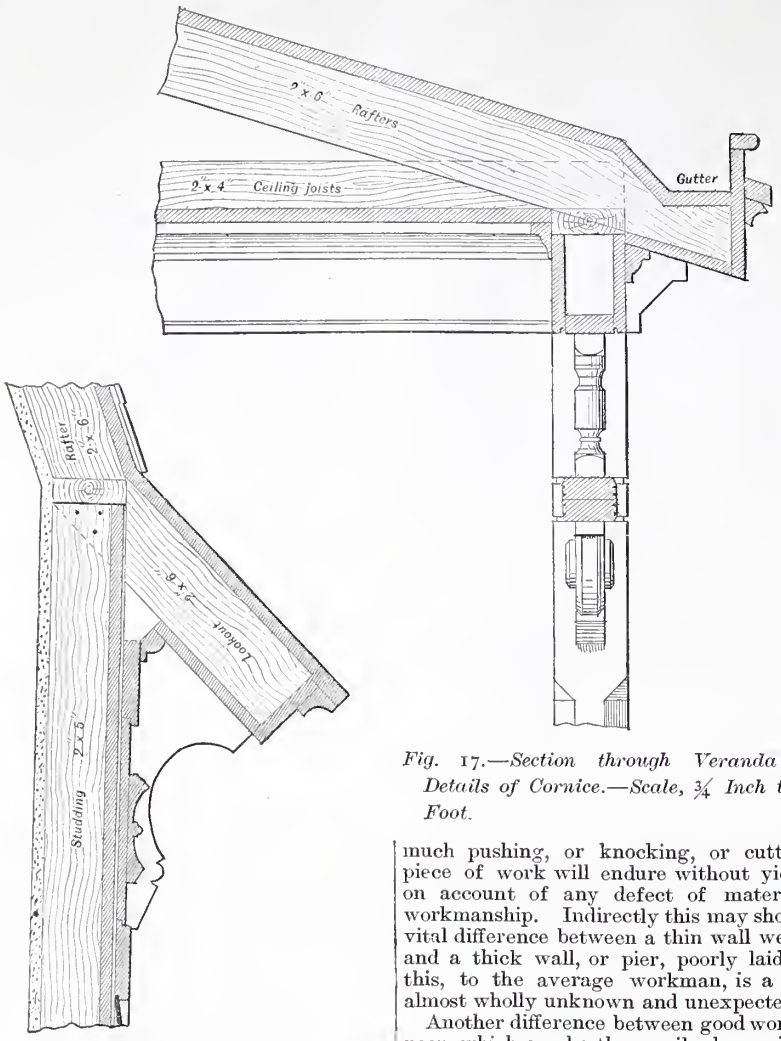


Fig. 17.—Section through Veranda with Details of Cornice.—Scale, ¾ Inch to the Foot.

Fig. 18.—Detail of Tower Cornice.—Scale, ¾ Inch to the Foot.

The effects of various mixtures of mortars or cement can be readily explained, and, what is more to the purpose, can be illustrated in the most telling kind of a way, for not only can the student lay up the brick, but he can have the opportunity of cutting into the pier or wall, after the lapse of time enough to permit the proper hardening. much pushing, or knocking, or cutting a piece of work will endure without yielding on account of any defect of material or workmanship. Indirectly this may show the vital difference between a thin wall well laid and a thick wall, or pier, poorly laid, and this, to the average workman, is a thing almost wholly unknown and unexpected.

Another difference between good work and poor, which can be thus easily shown, is that due to laying the brick dry, and also after they have been properly wet, so as to prevent the absorption by the porous brick of the water from the mortar. Incidentally, too, can be shown the possibility of the proper hardening of brickwork under water. In fact, the greater part by far of all the work likely to come under the eye or charge of an engineer, in a long series of years, can be thus closely illustrated to a beginner; and, if to be forewarned is in any case to be forearmed, this is one in which it is not only practicable, but highly desirable.

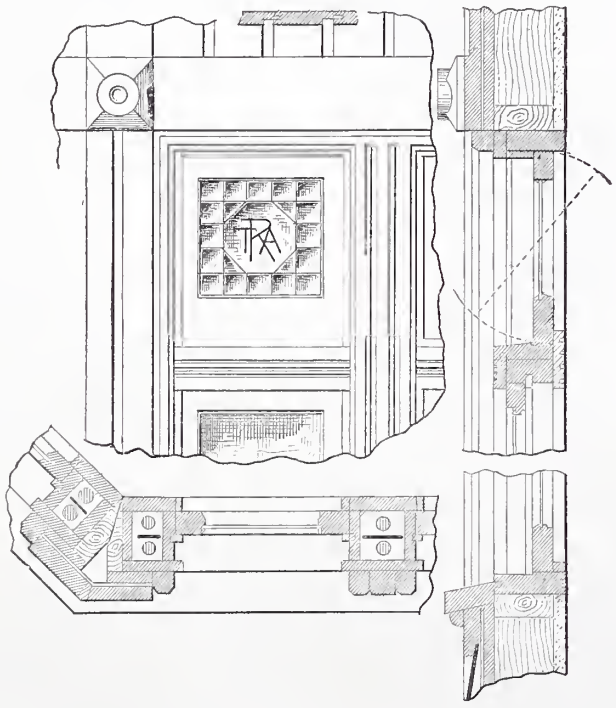


Fig. 19.—Plan and Section of Bay Window with Detail of Stained Glass in the Upper Part.—Scale, ⅜ Inch to the Foot.

NOVELTIES.

The Long Island Terra Cotta Works

We have recently received from Messrs. Rudolph, Franc & Co., 218 Fulton street, proprietors of the Long Island Terra Cotta Works, a very neat and attractive catalogue of

Fig. 20.—Detail of Corner Staffs.—Scale, ¾ Inch to the Foot.

the goods manufactured by this concern. The catalogue is in book shape so far as its outside appearance is concerned, and has a handsomely embossed cover with gilt side title. On opening it, instead of finding the pages in book form, something like a portfolio is provided with flaps turning from each end and the side of the right-hand half. Within this on loose sheets handsomely lithographed in ink, the color of which closely resembles burnt terra cotta, are the designs. By a note on a paper cover inclosing this we learn that only a portion of the catalogue designs have been finished, but no less than 12 plates were inclosed, each containing a number of handsome and appropriate designs of tiles, rosettes, crestings, belt courses, finials, &c.. This concern manufactures, in addition to the work above mentioned, roofing tiles and molded brick. Architectural terra-cotta work, however, is the leading line of goods to which attention is given. A price list accompanies the designs. We understand that the company has prepared these catalogues for gratuitous distribution, and that a

copy will be sent to each architect and builder applying for the same. It forms a neat addition to any library, and is so convenient for reference, to say nothing of the appropriateness of the designs contained for general use, that we have no doubt many of our readers will serve their own interest by procuring copies.

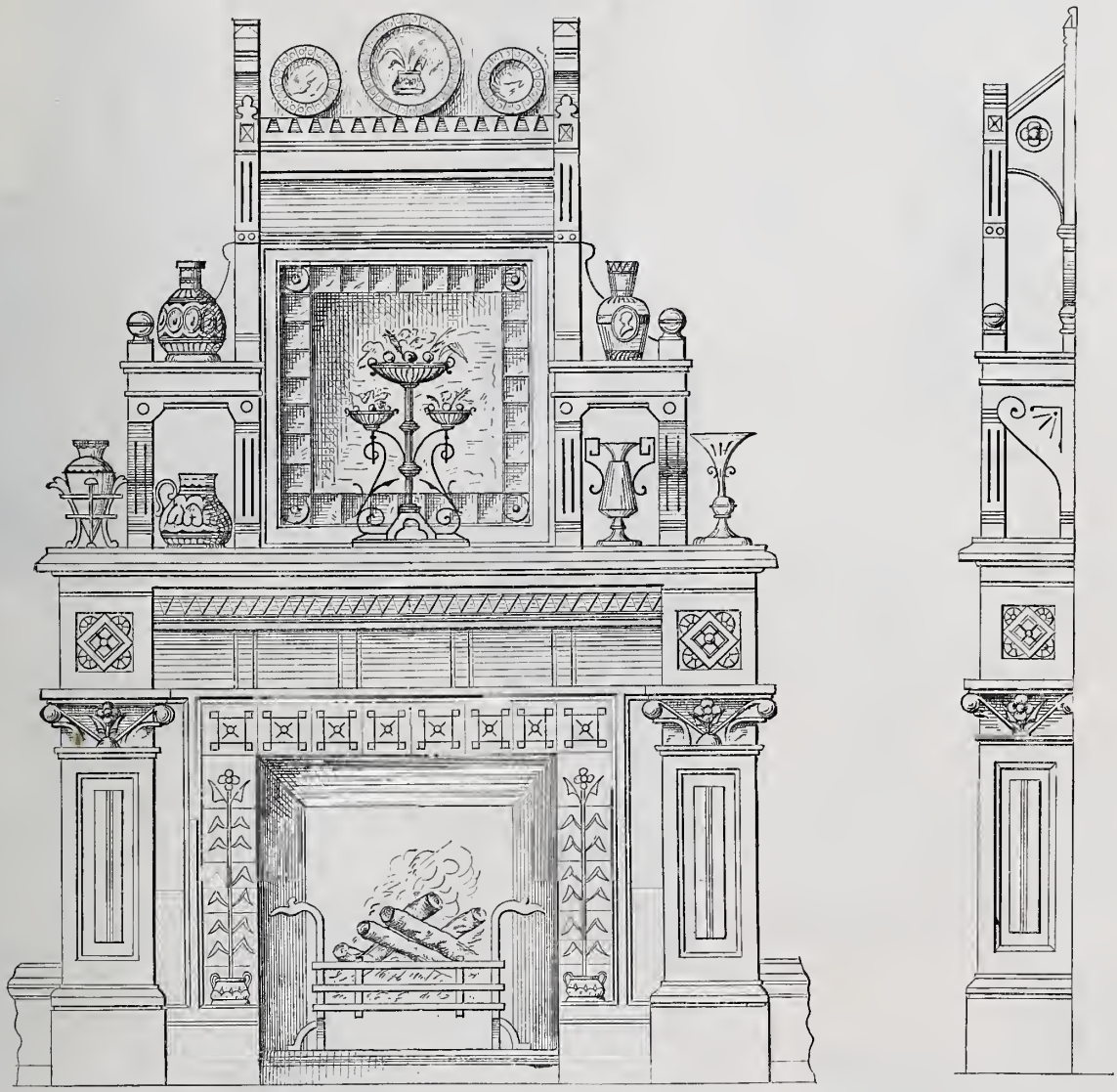
Improved Copying Paper.

The almost universal practice of copying business correspondence, architects' specifications and other documents lends interest to any improvements in the facilities employed for performing this operation. Messrs. Rural Adams & Co., Nos. 4 and 6 Pine street, New York, are introducing an improved article of copying paper which has achieved quite a reputation abroad, being used in both the British and Australian Government offices. This paper is buff in color and is made in two grades, one about as thin as the ordinary copying paper and the other considerably thicker. The latter affords a convenient substitute for written duplicates, and therefore accomplishes a great saving of manual labor. The chemical composition of the paper is such that a fair copy may be made with almost any of the ordinary writing fluids, thus enabling the person employing it to dispense with all but one kind of ink upon the desk, a matter of considerable interest. The method of using this paper is not unlike that employed in other cases. For copying manuscripts in which copying ink has been employed and which has been recently written, all superfluous moisture is thoroughly removed and then the copy is impressed in the usual manner. Several copies may be taken from one writing by making them separately and making each succeeding sheet a little damper than the one preceding, and pressing the copy against it for a little longer time. In copying manuscripts which have been written several days, or which have already been copied once, or which have been written in non-copying ink, this paper answers a very satisfactory purpose by being dampened somewhat more thoroughly and pressed a little longer than would otherwise be required. The thin copying paper mentioned above is warranted by the agents to give four bright, clear copies from copying inks, and two copies from most of the writing fluids.

Terra Cotta Lumber.

We made some reference to an article bearing the name of "Terra Cotta Lumber," in one of our issues several months since, but a further description will be of interest to our readers. This name has been adopted as a trade-mark to designate a new composition of material, the component parts of which are kaolin clays, the discovery of Mr. C. C. Gillman, of Ohio, in 1881, and patented in the United States, Canada, England, and in various countries on the Continent of Europe. The mixture of clays and vegetable matter for the purpose of making brick light in weight and tough in texture, by the subsequent expulsion of the latter in the process of burning, is by no means a new practice. Our readers may recollect that the exodus of Moses with the Israelites from Egyptian rule, has been assigned to the unwillingness or the inability of the Israelites to furnish straw for brick-making. This practice has given rise to a well-known proverb of making bricks without straw, which is a trite saying in various connections. The selection of materials possessing peculiar characteristics, thereby permitting a treatment of the burned product with edged tools, is a novelty. The product itself is of interest to the building public. Without going into particulars concerning the manufacture of this article, we will state that the Gillman Porous Terra Cotta Co., with office at 71 Broadway, New York City, has commenced its manufacture upon a commercial scale, and are now prepared to fill orders. Its uses are in the way of architectural fire-proofing, boiler and steam pipe sheathing, liquid fuel-holders, fire-proof receptacles, chimney and chimney linings, furnace linings, grain-storage bins, filters and electrical insulation. It derives its name of lumber from the fact that after the material has been shaped in large pieces, technically known as "logs," they are literally sawed into planks or boards and dimension stuff, in a manner similar to that in which lumber is manufactured. The texture of the material is such that it may be subsequently fashioned in the workshop into such forms and articles as circumstances demand. The material is free from grit and quite tough in texture, and may be worked with edge tools without detriment to the latter.

For work requiring a finish the material is run through a planer, which in design is a slight modification of the machine used in ordinary woodwork. A heavy knife is about the only change required. The texture of the material is such that it will hold screws or nails, thus making it much more advantageous for use than any similar article ever put upon the market. It is well adapted for inside partitions, because what plasterers call a hard finish may be applied directly to its surface without previous preparation. It is also well adapted for purposes of roofing. Its non-conducting properties render it cool in summer and warm in winter. Slate or shingles can be nailed directly to it. The

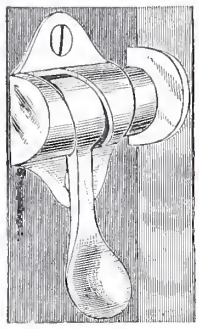


Second Prize Design.—Fig. 21.—Elevation and Section of Mantel in Dining Room.—Scale, ¾ Inch to the Foot.

usual sizes of terra cotta lumber as furnished are about 4 feet long by 9 to 12 inches wide. Almost any sizes required can be supplied to order.

The Practical Window Sash Fastener.

Messrs. Hydo, Ayer & Co., are putting upon the market the window-sash fastener shown in the engraving. It is a fastener and lock combined, and presents many features which recommend it for use. The advertisers claim for it that it is the only fastener in the market that will hold and lock a window at any point. The action of the fastener is so clearly shown in the engraving that a description is hardly necessary. A bearing plate is fixed against the sash stop, while the fastener itself is screwed to the sash. The handle of the fastener revolves in an eccentric groove in such a way as to drive the bolt more or less tightly against the stop, according to the amount of revolution given it. By this construction it will be seen that any slight inaccuracy in the fit of the window is compensated for by the construction of the



Novelties.—Fig. 1.—Practical Window Sash Fastener and Lock.

fastener. It is further recommended as preventing all rattling of windows, and is so simple that even a child can raise, lower or stop the window at any point that may be required. It has the further advantage of being put on and used without cutting or disfiguring the sash or casing. Different styles are manufactured, the kinds now offered being japanned, tucker-bronzed and nickel-plated.

The Stephens Patent Vise.

The Stephens patent toggle-joint vise is claimed by those who have used it to be superior, in many respects, to the ordinary screw vise. It works freely, and firmly holds the piece operated upon without regard to the pressure applied. There is no lost motion, due to the wear of screws and nuts, and the front or movable jaw is worked by hand, insuring a rapid movement and saving of

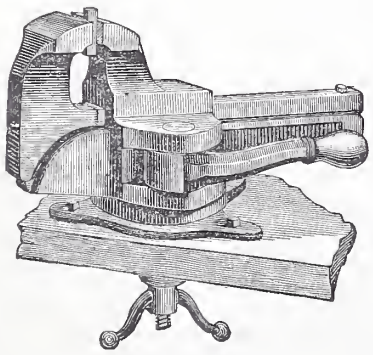


Fig. 2.—The Stephens Patent Vise.

time. The holding capacity of the vise has been thoroughly tested, and, judging from testimonials submitted by the manufacturers, entire satisfaction appears to have been given. In connection with the vise, the Stephens patent taper or swivel jaw is worthy of notice. It consists of a separate tool secured to the bar between the jaws of the apparatus. By means of this taper jaw, joints or openings between the line of power and the line of resistance are avoided, leaving the vise free from any tendency to weaken or break. The taper attachment works automatically, and will be found specially serviceable for key filing and irregular work. We present an engraving of one size herewith. The office of the company is 41 Dey street, New York City.

Artistic Grates, Fenders, &c.

A very handsome illustrated catalogue, containing upward of 100 colored illustrations, besides nearly 100 more ordinarily engraved cuts of grates, fenders, fire irons, &c., has recently been issued by the J. L. Mott Iron Works, Nos. 88 and 90 Beekman street, this city. On the first page of the catalogue, handsomely worked in tints, the special attention of architects, builders and house owners is directed to the fine line of goods here presented as being of interest as well as a business advantage. The illustrations are worked in several colors, and in character are fair representations of bronze and tile work. The book is very artistic in character, very neat and tasteful in appearance, and would make a desirable addition to any architect's library. Large contractors and builders, who have occasion to consult a work of this kind in order to determine what patterns to employ in finishing their houses, will also find it advantageous. To distinguish it from other volumes issued by this firm, it is called "The Fire Place." We risk nothing in saying that it is deserving of the most careful examination.

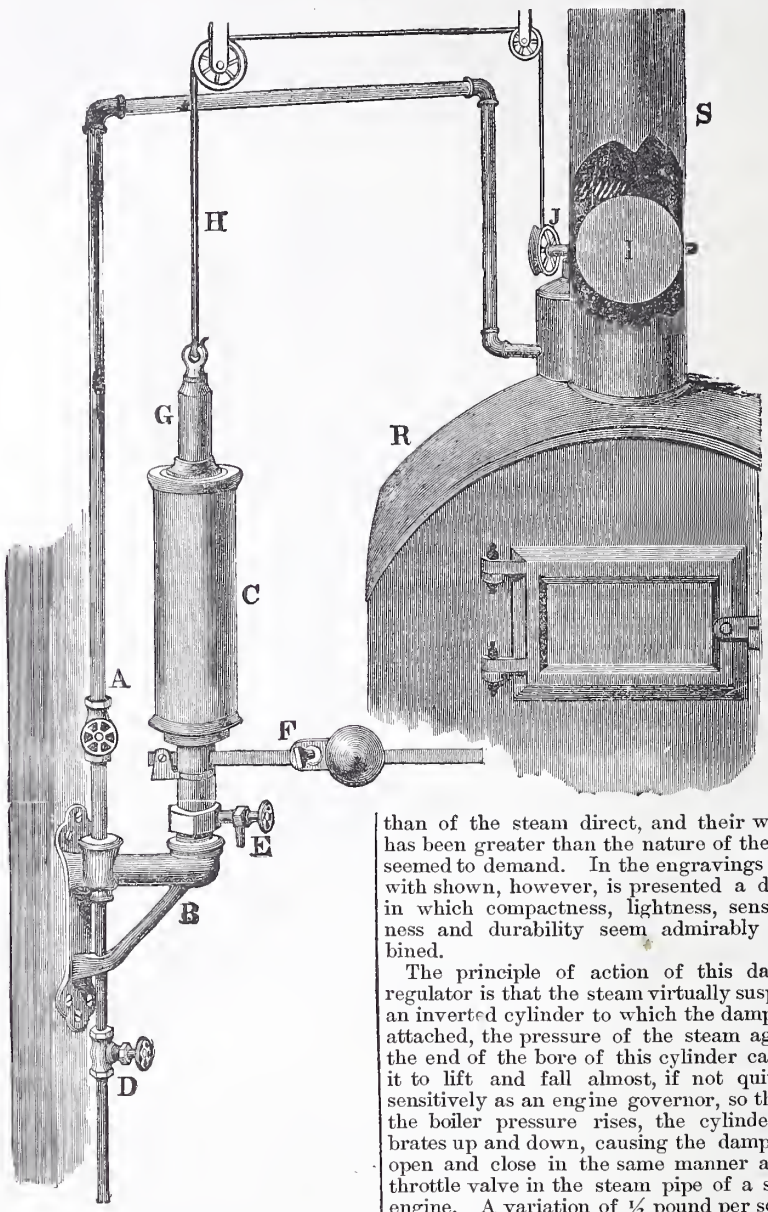


Fig. 3.—Kellam's Damper Regulator.—General View of the Apparatus.

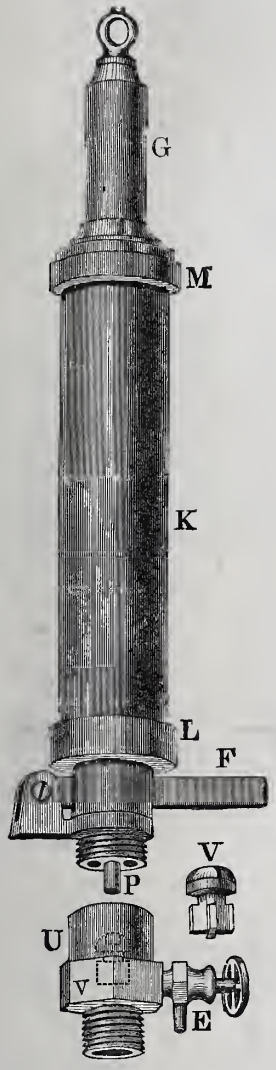
Kellam's Damper Regulator.

One of the most desirable methods of maintaining a constant and equal steam pressure in a boiler is that of regulating the draft by means of the damper, so that as the consumption of steam decreases, the consumption of fuel shall also decrease, and the waste of steam through the safety valve shall be avoided. A damper regulator that will do this effectually is, at the same time, a valuable safety appliance, since it will prevent, by checking the combustion, an undue increase of steam pressure, even though there be no steam taken from the boiler. Usually damper regulators have been operated through the medium of water, rather than of the steam direct, and their weight has been greater than the nature of the duty seemed to demand. In the engravings herewith shown, however, is presented a design in which compactness, lightness, sensitiveness and durability seem admirably combined.

The principle of action of this damper regulator is that the steam virtually suspends an inverted cylinder to which the damper is attached, the pressure of the steam against the end of the bore of this cylinder causing it to lift and fall almost, if not quite, as sensitively as an engine governor, so that as the boiler pressure rises, the cylinder vibrates up and down, causing the damper to open and close in the same manner as the throttle valve in the steam pipe of a steam engine. A variation of ½ pound per square inch in the boiler causes a very perceptible movement of the damper, and a variation of 2½ pounds is sufficient to fully open or close the damper, as the case may be.

The construction by means of which these excellent results are obtained is as follows: In Fig. 3 the general application is shown, and in Fig. 4 the construction of the parts. Referring to Fig. 3, A is the steam pipe from the boiler to the regulator; B, a stand to support the regulator; F, a valve to adjust the regulator to suit the pressure of steam to be carried by the boiler, and C is a weight to balance the weight of the damper. Referring to Fig. 4, the part U, through which the steam from the boiler passes, contains a small valve V, upon which rests the pin P, which receives the weight of the lever F, upon which is a ball to regulate the pressure at which the valve V shall open and close. Steam, after passing the valve, passes through the openings Q and finds exit at O, and acts upon the cylinder G which envelops the piston Y. A steam-tight joint between Y and the bore of G is made at W, which has the grooves W for water packing. Cylinder G is secured to the stem n, which passes at N^1 within Y, and thus forms an accurate and easy guide for G as it vibrates up and down Y, as it does with a very slight fluctuation of boiler pressure.

When the steam pressure rises above what is required, the valve V opens, admitting steam, which lifts G, and closes the damper. As the pressure falls the valve V closes and the damper opens; finally, after valve V has closed, the steam in G condenses and the damper opens wider and wider, being full open when G has fallen to its lowest point. Under ordinary conditions the damper is



Kellam's Damper Regulator.—Fig. 4.—Cylinder, with Details of the Valve.

partly closed, and G fluctuates up and down upon Y as the boiler pressure varies, each motion of G producing a corresponding motion at the damper. Mr. Frank A. Hine, of 81 Maiden Lane, New York City, is the general agent for this apparatus.

Improved Hack Saw.

Every mechanic who has anything to do with the ordinary hack saw, is interested in the problem of filing the same and keeping it in good order. An improvement introduced by Messrs. C. E. Jennings & Co., 96 Chambers street, New York, is known as the Griffin Hack Saw, and does away with the necessity of filing the blade. By the engraving which we present herewith, it will be seen that the blades are detachable. When the saw blade has become too dull to be fit for use, it is thrown away, and a new one is inserted. The means by which the blade is put in place or removed are very simple, and are readily understood from the engraving. The handle is made open, and in the space thus provided a lever works, by which the tension of the blade is maintained. The blade is fastened in place by two simple pins. With each saw as sent out from the factory, a dozen blades are provided. These blades are very highly tempered, and are made so hard, in fact, that a file will scarcely touch them. Accordingly, the saw is much more serviceable for the rough work it is expected

Kellam's Damper Regulator.—Fig. 5.—Detail of Piston of Damper Regulator.

to perform. Four sizes of saws of this description are made, the length of blade being 6, 7, 8 and 9 inches.

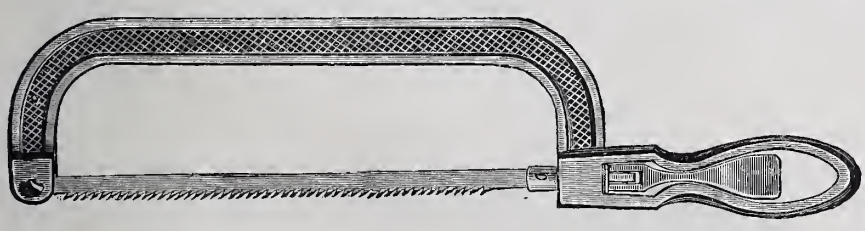


Fig. 6.—Griffin Hack Saw.—Manufactured by C. E. Jennings & Co., New York.

Diaphanic Tiles.

Messrs. Van Campen & Co., Franklin Square, New York City, are putting upon the market an article that is known as diaphanic tiles, which were introduced for the first time last fall. They are recommended by the manufacturers as the most perfect substitute for stained glass that has ever been offered to the public. They state further that for color effect they are in every way its equal. The tiles are made of a thin, translucent material, pliable, easily handled and so prepared as to be self-adhesive. They are furnished in various plain tints, and also decorated with a great variety of designs. The diversity of tints and designs afforded presents an opportunity for the exercise of the amateur's talents in combining colors into beautiful and harmonious effects. These tiles may be used for all purposes where stained glass is appropriate; for windows of dining rooms, libraries, halls, bathrooms, transoms, side lights, vestibule doors, &c. They are also suitable for use where it is desirable to obscure the view, as in sash doors between chambers in the place of ground glass which is ordinarily employed. The manner of application of these tiles is simplicity itself. The glass is first perfectly cleaned. The tile is then placed in the proper position, and is laid smoothly and firmly against its surface, all air bubbles being carefully excluded. After a few hours the tile will be found to adhere so firmly that it can only be removed by scraping with a steel blade. The tiles are water-proof, thus making it possible to clean the window, after they have been applied, without damage. As an additional protection, the backs of the tiles may be varnished, after mounting, with a clear white varnish, if desired. This, however, the manufacturers assert, is not essential. Besides being suitable for use in imitation of stained glass, these tiles may be employed for decorating mantels, furniture, &c., where translucence is not required. For this purpose they produce a very pretty effect, and afford a material which many amateurs will find great pleasure in employing. In using the tile in imitation of stained glass to obtain the full effect, lead foil is employed in a manner to imitate the leaden sash which it is customary to use in connection with stained glass. The foiling of the glass is a simple matter, and full directions are furnished with every package of material sent out by this company for the purpose.

Adjustable Saw Handle.

Many of the readers of *Carpentry and Building* have occasion to use what are commonly called one-man cross-cut saws, various kinds of which have been in the market for a number of years. These saws are provided at one end with a fixed handle somewhat like that of an ordinary hand saw, while adjustable handles, that may be attached at either

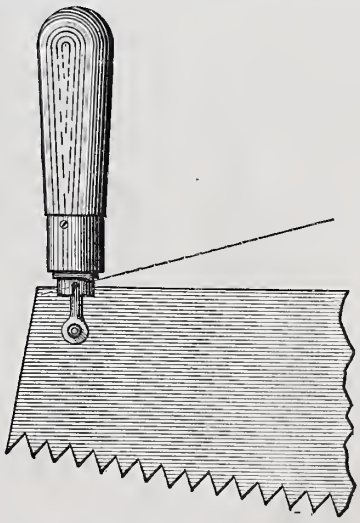


Fig. 7.—Improved Handle for One Man Cross Cut Saws.

end, accompany it, thus adapting the saw for use by two men in cutting off large logs or beams. The Richardson Saw Works, Newark, N. J., whose goods are favorably known to our readers, have recently introduced an improvement in handles for use upon saws of this kind, an illustration of which appears in Fig. 7 of the engravings. The peculiarity of this handle is in its construction. It is so made that it is possible to put it upon the saw at right angles to the blade, as shown in the illustration, or by turning it so that notches in the bearing which comes against the back of the blade, opposite those that are against the blade, as shown in the engraving, come in use, it may be set at an angle, inclining either front or back, as the case may be. The handle is attached to the blade by a rivet or pin, as shown in the engraving, and is drawn tight by simply revolving it in the hand. It is therefore easily removed when not required for use. Those of our readers who have the opportunity of examining a handle of this kind will undoubtedly appreciate its advantages.

CORRESPONDENCE.

An Itiner nt Fraud.

From A. L. W., *Indianopolis, Ind.*—I desire to inform you of a misfortune which overtook my file of *Carpentry and Building* a few days since. I have been taking the paper for the third year and feel that I could not do without it, therefore I prize all the numbers. On last Saturday a man came to my house and told my family that I was at a building a few squares off and desired to see a plan that was in one of the papers ; he did not know which number the plan was in, and therefore asked that all the numbers for this year be delivered to him. He played the same trick upon a friend of mine. He also collected a dollar for one year's subscription to *Carpentry and Building* from one of the men that is employed by the same firm for whom I work. This man evidently is a fraud, and the police should be put upon his track. I regret that I am unable to give his name, not having learned it.

From E. B. WINGATE, *Shelbyville, Ind.*—I would like you to send me the back numbers of *Carpentry and Building* from March to August of the present year inclusive. I have had my numbers captured by a man pretending to be an agent for the paper. He secured several subscribers, and finally asked me the usual question. I replied that I was already taking the paper and that I liked it very much ; thereupon he found his way to my house and told my family that I had sent him there to get the March number of the paper and all the following issues. By this means he supplied himself with sample copies of the paper, but instead of returning to me as my family supposed, he left on the evening train. I think you should be informed of this person's operations in order that he may not swindle still others.

Note.—For several months past in various sections of the country, we have heard of the operations of the individual referred to in the above letters. We have made ineffectual attempts to capture him or to otherwise stop his nefarious operations. On one of our cover pages this month will be found a description of him and a general warning to our friends throughout the country against him. It will be obvious to any fair-minded person that publishers are liable to impositions of this kind, and the most that we can do is to warn our subscribers against them. We trust this *exposé* will have the effect of saving our friends from further imposition, if not the actual capture of the scoundrel.

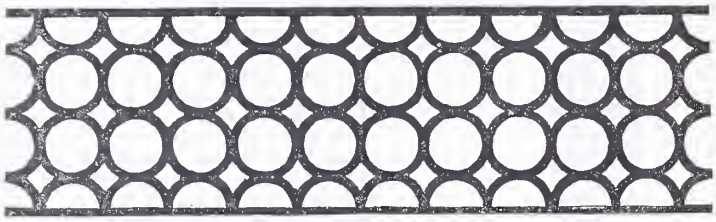
Hanging Pictures.

From S. P. G., *San Antonio, Texas.*—Has anything been contrived for hanging pictures in the house that does away with the bad practice of driving nails into the walls ?

Answer.—All the better houses, at the present time, are finished with what is called a picture rail or picture molding, being a wood molding of suitable design worked into the cornice of the room, or else as one of the decorative features in connection with wall paper or painting. The general features of the molding are such that a hook, commonly known as a picture hook, may be hung over its top in any position. This hook receives the wire or cord by which the picture is hung. A great advantage attending this arrangement, besides saving the mutilation of walls, is that pictures may be hung at any place, and that they may be altered as it suits the caprice of the housewife to change them. Several different varieties of picture molding or picture rail are in the market, the more common of which are fastened to the wall by nailing directly through the molding without reference to its members. An improved variety has a deep incision among the members with which it is worked, through which the nails are to be driven, thus practically concealing them from view. These molds are furnished in the natural woods, also ebonized and gilt.

Peculiar Pavements.

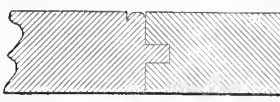
From H. M. GRIFFITHS, *Flagship, European Squadron, Alexandria, Egypt.*—It has been some time since I have seen a copy of *Carpentry and Building*, owing to my neglect in not arranging for the paper previous to leaving the United States for a three years' cruise. In my travels I see much that would be of interest to your readers, but I do not find time to put it on paper. On our visit to Lisbon, Portugal, where we remained for a few days, I noticed some very peculiar, simple and unique pavements, of which I inclose a sketch of one of the simpler designs. The circles represented were in black, while the larger spaces were in white, all being composed of broken marble or granite, the pieces laid adjoining each other. This gave it the appearance of one large walk of variagated marble. Walks of this kind are laid upon a bed of gravel 4 inches deep. The fact that there is no frost in this country may explain the cause of these pavements looking and lasting so well. Their fine and neat appearance should induce persons of moderate means to experiment as to the proper foundation to be used under them in our own country.



Peculiar Pavement —Sketch from H. M. G.

Improvised Tools.

From S. K. F., *Camden, N. J.*—Very often a carpenter is sent to do some jobbing, without knowing just what kinds of work he will be called upon to perform, and therefore he is not able to select the tools he will have occasion to use. Sometimes, after he reaches the place, he will find that he has neglected to bring some tool that he very much needs. For example, a short time ago I was required to match two boards together. The joint needed to have a 3-16-inch bead, as shown in Fig. 3 of the sketches. As I did not have the necessary tool with me, and it was too far to return to the shop, I decided to improvise one. I procured a small block of wood and ran a screw into it so that the head projected far enough to answer for the quirk, as indicated in Fig. 2 of the sketches.



Improvised Tools.—Fig. 1.—The Bead to be Made.

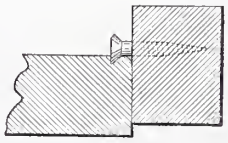


Fig. 2.—The Tool Constructed for the Purpose.

A board to be beaded in this manner must have the corner broken with a smoothing plane, as in ordinary small beads. When this is done, take the block with the screw-head and fasten it over the edge to be beaded, bearing on it slightly. One who has never tried this instrument will be surprised to see what a nice bead can be made by means of this method. The lower half of the screw-head acts as the cutter, and the small thread or shavings pass up the cut in the head. A block of this kind can be used only for ¼ inch and smaller beads.

Sometimes a carpenter requires a level when he has neglected to bring one from the shop. A simple method of leveling is to place the tongue of a steel square on the object to be leveled, and plumb the heel by means of a plumb line, adjusted as shown in Fig. 4 of the sketches. When the string of the plumb is parallel with the lines of the tongue of the square, the blade lies in a level line.

Science in Bridge Building.

From A. F. H., *New York.*—Your rather ungrammatical, very aggressive and decidedly slangy correspondent, Mr. H. McG., feels undoubtedly that his communication in the August number of *Carpentry and Building* has convinced the world at large that all the knowledge on the subject of truss framing is concentrated—preserved in vacuum, as it were—in the cranium of Mr. McG., and to use his own elegant phraseology, that, as far as bridge and stair builders are concerned, he has "settled their hash for good."

The writer suspects that there are a few bridge builders left, though, who are not completely overwhelmed yet with a sense of Mr. McG's immensely superior wisdom, and the writer is among that number. Thanks to the liberality of your paper, Mr. McG. has had space equivalent to about 2000 words allowed him for the venting of his fulminations, and he can, therefore, not complain that his large ideas failed to find expression for lack of space. The writer now appeals to every intelligent carpenter to say whether Mr. McG. has, in all the space granted him thus far, expressed a single idea that would be a help to any one not a bridge carpenter, or something new to any one familiar with truss framing ?

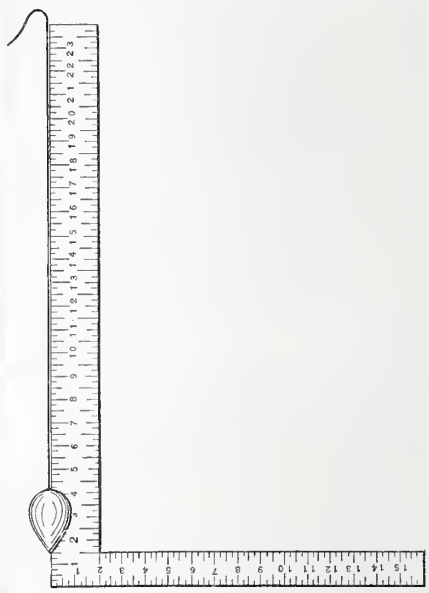


Fig. 3.—A Convenient Device for Leveling.

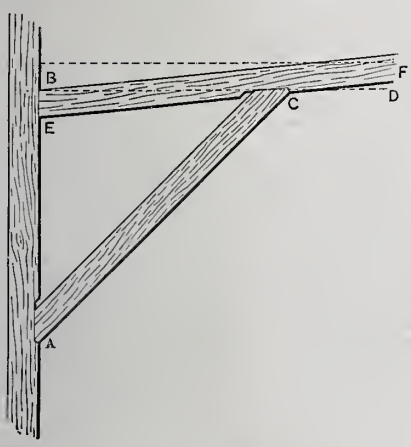
All that he says about the different ways in which a camber may be framed-in, is moth-eaten, worn-out, down-at-the-heels, long-forgotten and rehashed and warmed-up-again stuff. As he says, there are many ways in which to spell a word—Artemus Ward and Petroleum Nasby have shown that, and that's why they are so funny—but there is only one correct way of spelling, and so there are many ways in which a camber might be framed in, as Mr. McG. has shown us, and that's why he is so funny ; but there is only one way which commends itself as the most practical and best, and therefore correct one.

Both H. F. A., Bangor, Me., and Northwestern, Springfield Mo., replied fully and with more patience than the writer possesses. Mr. McG. wisely ignores their replies but quotes from other correspondents, and then politely calls them all, indiscriminately, "a nice lot the whole of them, conclusive egotistical," &c. Slangy insolence can never take the place of argument in a scientific dis-

cussion, and any discussion pertaining to bridge building is necessarily a scientific one. Any argument advanced in a technical journal on a technical subject, no matter how fallacious, is entitled to serious and respectful consideration, and if decently presented is sure to receive it. But when men, who spell by ear and are deaf, attempt to quote Trautwine and De Volsen Wood, and from their application of the quotations show that they cannot understand what they read, and then proceed to indulge in cheap smartness at the expense of others probably more conversant with the subject, then their lucubrations are not entitled to serious treatment, and it is but charity to tell them that mental paralysis is not desirable in bridge shops; that they must be, in fact, reborn, in order to be fit to receive such liberal education as will enable them in after years to appreciate the teachings of those who, by long study, large practice and faithful work, have elevated bridge building from the science it always was to the fine art it is to-day in this country.

Length of Braces.

From F. H. *Manistee, Mich.*—Replying to the question proposed by G. L. M., in the July issue of *Carpentry and Building*, suppose the brace is required to be set under a

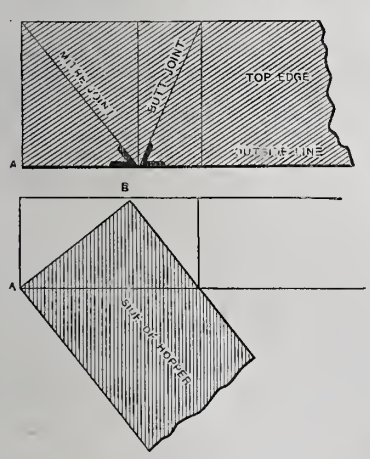


Length of Braces.

support or girt that rises from the horizontal at an inclination of 2 inches to the foot. If the rise is from A to E on the inclosed sketch, and the run from B to C is 4 feet, add 8 inches to the rise. In other words, add the hight E B to the hight A E, and bevel the upper end of the brace to correspond with the pitch of the girt.

Hopper Bevels.

From G. S. A., *San Francisco.*—I think perhaps I am able to throw some light upon the hopper question. I will give the readers of *Carpentry and Building* the benefit of my practical experiments in that direction.



Hopper Bevels.—Fig. 1.—*Sketch Representing G. S. A.'s Experiment.*

Having fixed upon a slant, I beveled the edge of a board so that when in position it would be horizontal. I next squared across the beveled edge, and, having marked the proper slant, sawed to the lines thus obtained. I then planed off the bevel and brought it to a square edge again. I went through the same performance with a miter cut, afterward making the edges square again. I have attempted to represent these steps in Fig. 1 of the sketches inclosed, which may be submitted without further explanation.

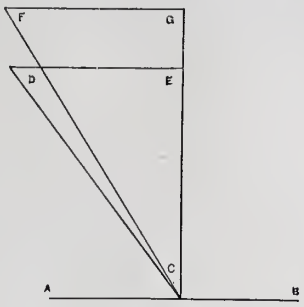


Fig. 2.—*An Attempt at Clearing up Points in a Communication from W. B. in the January Issue.*

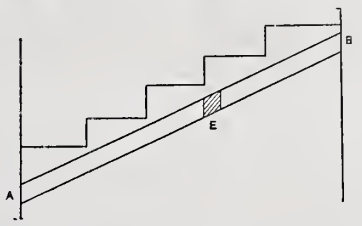
Fig. 2 is intended to make clear the third diagram in the article by W. B. on "Hopper Bevels," published in the number for January, this year; besides, the present article would not be complete without it. C D represents the pitch of hopper, and C E the perpendicular hight. Make C C the length of C D, because, when in position, C G will be a diagonal to the pitch C D. Draw F G parallel to D E and of the same length. Join C and F, which will be the cut of ends, or, as W. B. terms it, "corners." Assume that both triangles are perpendicular. Incline the tallest one with the line A B as an axis to the pitch C D. Then the line F G will be level with the line D E and the line C D and C F will range.

Farm Houses.

From S. E., *Alexanderville, Ohio.*—I was much pleased with the suggestion of B. S. H., of Cooksville, Wis., published on page 79 of the current volume, with reference to farm houses. While farmers in many parts of this broad land are rapidly accumulating wealth, and while many of them manifest a laudable ambition to build comfortable homes, yet the fact remains that there are but very few model farm houses. It is not because there is not enough money invested in them, but, rather, because farmers do not properly appreciate the importance of building so as to secure the greatest comfort and convenience for the money spent. It is very often noticeable that even where elaborate plans are adopted and liberal means employed in building farm houses, the result is an ill-arranged dwelling out of all harmony with the surrounding scenery. There is no subject about which our rural population needs more correct information than that which pertains to the planning and building of their own homes. I know of no means that would diffuse so much valuable information as the progressive study in house building now being published in the paper. Such a system of competitive designs for a farm house, say of ten rooms, would throw a flood of light on a difficult problem. I am sure that if you would act on this suggestion when a suitable opportunity is presented, it would be duly appreciated by your country readers generally.

Hip Roofs.

From G. S. A., *San Francisco.*—I find that the correspondents of *Carpentry and Building* are very much interested in the subject of hip roofs. Many years ago I was confronted with my first job of this kind. I consulted all the books in my possession, but was not willing to take the lines I found in them on trust. Thereupon I did what I would advise every young mechanic to do—I endeavored to think out the job for myself, and here is the result: I got two pieces of short wood, say 2 x 4 inches, one for my jack rafter and one for my hip rafter. I sawed off one of each in the miter box. The pitch of the roof I agreed should be 5 inches to the foot. The pitch of the hip to correspond was 3½ inches to the foot. I sawed the blocks to these pitches, and at once had the required bevels. All I needed more was to cut the backing off, which in the case in point was 3 inches thick. I gauged on to the edge of my hip block 1½



Timbering Stairs.—Fig. 1.—*Section showing Braces Across the Corner at Bottom.*

inches, placed the two blocks in position, and carried the line of jack rafter up to gauge mark, and the thing was done. The same method will apply to making a miter box for raking moldings.

Timbering Stairs.

From C. H. C., *New York City.*—I trust the Editor will excuse me for finding fault with the plan of timbering stairs, shown in the January number of *Carpentry and Building* for 1881. By the engraving in that number it will be seen that the timbering cuts off at the top end and falls 2 feet below at the bottom. I do not think it possible to fur

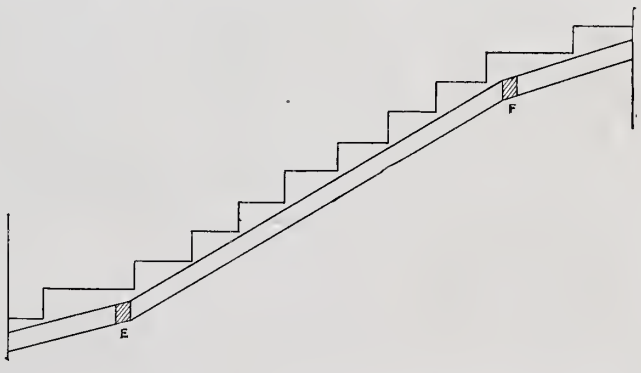


Fig. 2.—*Section showing the Top Brace with the Center Timber Meeting it at F.*

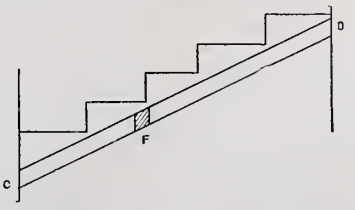


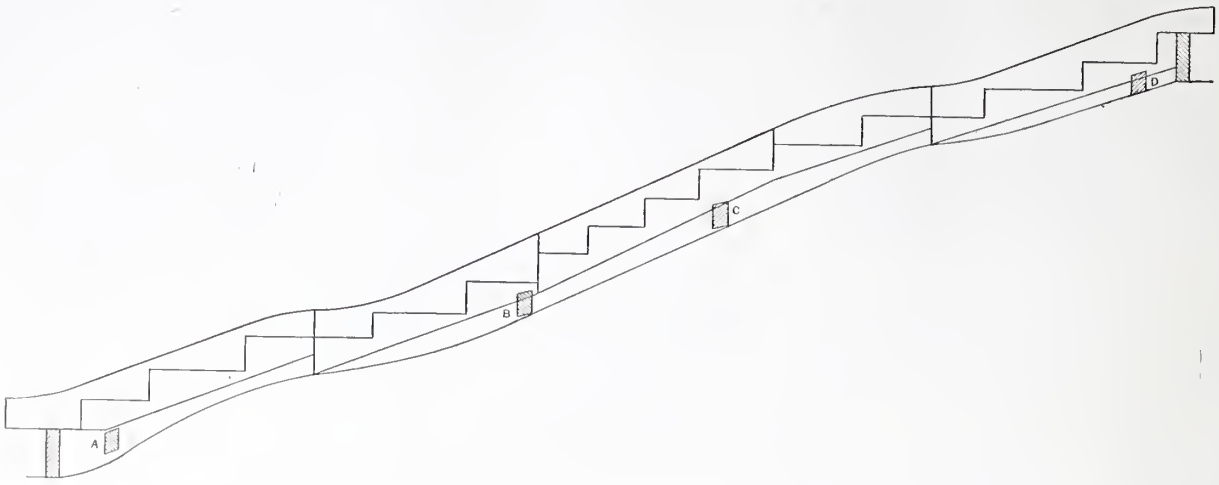
Fig. 3.—*Braces Across the Corner at the Top.*

the stairs in the manner shown in the plan. I put on no finishing lumber until the plaster is thoroughly dry. I plaster to a ground.

Note.—The criticism of this correspondent is evidently based on a misconception of the plan to which he refers. The center timber,

as shown in the engraving, does not run through, but is cut in between the top and bottom braces.

In further elucidation of this subject, we present some illustrations showing how the principal timbers may be placed with respect to steps and risers. Fig. 1 represents the brace thrown across the corner at the bottom of the flight. The center timber meets it at the point E. Fig. 2 shows the top brace with the center timber meeting it at F. It further represents the center timber cut off upon the braces at E and F. Fig. 4 shows the stretchout of the wall string with the line of furring underneath. The points A B C and D are the ends of the corner braces. We reproduce the plan, referred to by this correspondent, from page 16 of our volume for last year, and show in connection with it the views above described.



Timbering Stairs —Fig. 4.—Stretchout of the Wall String with the Line of Furring Underneath.

Criticisms on the First Prize Design.

From R. F. E., *Cincinnati, Ohio.*—Now that the prize design is published in the July number, I suppose criticisms are in order. I find that the upper sash of the dining-room bay-window, the upper sash of the front chamber bay-windows and the gable windows, when seen in the perspective, show a very different construction from that shown in the elevations. The porch posts, as shown in detail, are different in outline and decoration from the same posts shown in the elevation. The attic plan, published on page 119, shows a window over the rear of attic which is not shown on the roof plan or on the rear elevation published on page 120. These discrepancies are obvious at a casual glance. In writing specifications, which plans are to control?

Answer.—We take exception to our correspondent's last statement, that the attic plan published on page 119 shows a window over the rear of attic which is not shown on the roof plan, or on the rear elevation published on page 120. The rear elevation shows a finish at the point indicated which may easily be construed as a window, and the only way in which it could show upon the roof plan is the straight line by which it is indicated. Since the attic plan specifies a window at this point, we do not consider that there is a discrepancy. So far as concerns details and discrepancies between the perspective and elevations, we have nothing further to say than that such things are almost habitual with architects. It is rare indeed that an architect details work in all particulars, as suggested by his original sketch, in the elevations. We believe it is an accepted rule that an elevation takes preference over a perspective and a detail over an elevation. However, we do not interpose that as a rule in this matter. The drawings of the house in question are before our readers, and each competitor in the contest in specifications is at liberty to use his own judgment in details of this kind.

Estimates.

From J. I. M., *Westerly, R. I.*—I wish to suggest that an article on estimating would be valuable to the readers of *Carpentry and Building*. We have a great deal of estimating to do, and I find that one has to be very careful indeed or something will be omitted. It seems to me that if a person had a list of all the parts usually employed in the construction of a house, it would be a comparatively easy matter for him to look through the list and by this means see that he has included everything. My idea is to take the different parts of a house in the order that should be specified, thus:

INTERIOR.	EXTERIOR.	ROOF.
Bridging,	Planking,	Cornice,
Partitions,	Sheeting Paper,	Roofing Boards,
Boarding,	Clapboards,	Scuttle,
Furring,	Corner Boards,	Cresting,
Plates, Sills,	Casings,	Shingles, &c.
Studs,	Window Frames,	
Beams, &c.	&c	

Such a list would also be of great value in drafting specifications. If the list is complete the one using it will be sure to mention everything required. For one I should appreciate such an article.

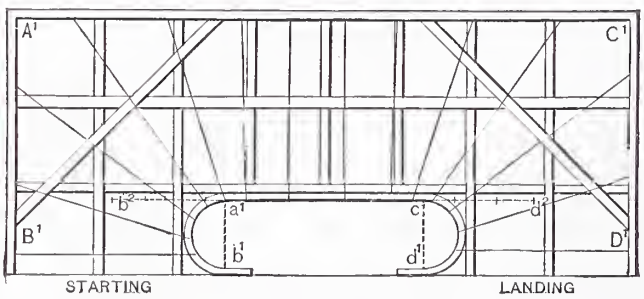


Fig. 5.—The Plan of Timbering Published in this Journal January, 1881, and Referred to in the Communication from C. H.C.

Note.—After our correspondent has given the subject sufficient attention to know exactly what is wanted, it seems to us that he is well prepared to get up just such a list as he has in mind. He is much better prepared to originate such a thing adapted to to his own use than would be some one else approaching the subject from a little different standpoint. If he will work out his ideas we will take pleasure in presenting them to our readers for criticism and discussion, feeling certain that nothing but good can come from an inquiry into matters of this kind. In the contest of specifications now open before our readers, we think much may be done toward systematizing the art of specifying in a way to be of great benefit to mechanics generally. We trust all those of our readers who are interested in this subject will give attention to this contest, not only in the hope of obtaining a prize, but also for the sake of adding to the general information upon this subject. Following the contest in specifications, as our readers know, is to be one in estimates, and it is hoped that careful attention to these two competitions will result in good to the trade at large.

Characteristics of the Figure 9.

From D. F. H., *Topeka, Kan.*— While reading a short time since an item entitled "Singular Harmony of Figures" the idea occurred to me that what was there narrated was very similar to the remarkable characteristics of the Figure 9 with which I was made conversant during my schoolboy days. When tired of poring over Daball's mathematical problems I would, for recreation, work out some of the changes of this number, which at that time (1835) to me seemed very singular. One peculiarity of this figure is that if it is multiplied by each of the nine digits the product is two figures, which added together make nine at each multiplication; thus $9 \times 2 = 18$ and the sum of $1 + 8 = 9$. Again, $9 \times 3 = 27$, and as in the former case, $2 + 7 = 9$, and so on to the last, $9 \times 9 = 81$ and $8 + 1 = 9$. This peculiarity I noticed while carelessly making figures on the slate. The resemblance of figures in the item above quoted to the several products in my figuring led me to experiment further with this wonderful figure 9. A result that I have reached is that if the nine digits are written in regular order and multiplied by 9, 18, 27, 36, 45, &c., each and every product is all of one figure, save the one occupying the tens place, which is a cipher in each multiplication. The remaining figures of the product are of the same magnitude as the digit used in multiplying the figure 9 for a new multiplier. For example, if $9 \times 4 = 36$ (new multiplier) the product is all in 4's with the exception of one figure, a cipher, which occupies the tens place. Again, if $9 \times 6 = 54$ (new multiplier) the product is all 6's with the exception of the cipher in the tens place, &c. If the order of the digits be reversed, for example, 9, 8, 7, 6, 5 4, 3, 2, 1 and are then multiplied by 9, 18, 27, 36, 45, &c., the products will be all one figure save the extremes which, read together, equal the multiplier every time except when it is 9. In this case the extreme right-hand figure will be 9 and all the others in the product 8's. There is one less figure in this product than in any of the others.

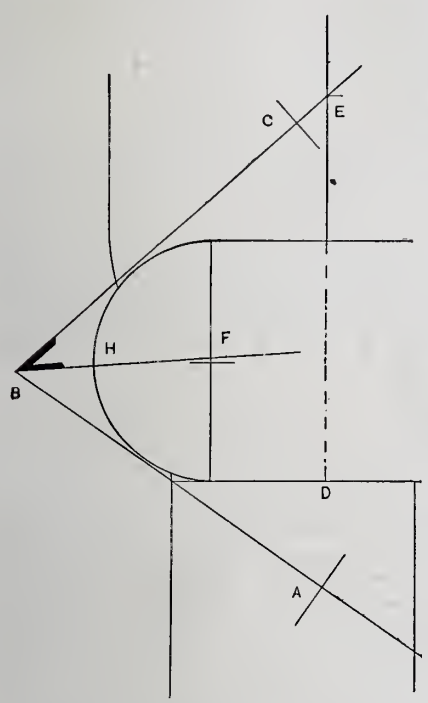
In this connection it will be noticed that the digit used in producing a new multiplier if added to any one figure of its product inside of the extremes will make just 9. For instance, if the figure 1 is used to produce a multiplier, the figures inside of the extremes are all 8's, one of which being added to the digit equals 9. When the digit 4 is used the inside figures are all 5's, one of which added to the digit makes just 9. When the digit 9 is used to produce a new multiplier the figures inside of extremes are all ciphers which, added to digit, equals 9.

Again, it will be noticed that the figure in the billions period are one less than the multiplier in each product. The multiplier 81 produces 80 billions, the product of 72 is 71 billions, of 36 is 35 billions, and of 9 it is 8 billions. The peculiarities of the figure 9,

to say the least, are remarkable. I do not know that any of the other nine figures is capable of such evolutions, or will, by multiplication, produce such uniform harmony in its relations as does this figure. I will be under obligations if some one who is well versed in mathematics will explain why the figure 9 is thus particularly favored. If any reader can point out other qualities applied to this number, let us have them.

Practical Stairbuilding.

From W. H. C., *Orillia, Ont.*—As a practical stairbuilder of long experience, I have generally found skillful mechanics ever ready to share their individual gleanings with others. Of course, I mean the details connected with the art. I have never found



Practical Stairbuilding.—Fig. 1.—*Plan Accompanying Letter from W. H. C.*

it necessary to refrain from drawing any pattern for stairs in the presence of other workmen, nor have I ever refused to give a helping hand to any one making a draft on my knowledge of the business. However, I like to help real students of the art, not those

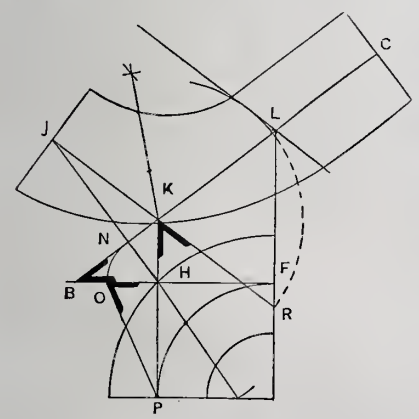


Fig. 2—*Pattern from Plan Given above.*

who come for help merely from mercenary purposes. From this you will see that I am not of the opinion of your correspondent A. A. F., of Cleveland.

In the hope of getting others to contribute practical hints for practical hands, since the paper itself is doing so well for learners in the rudiments of the art, I submit what I think will be of interest to advanced workmen. It is a method of doing away with the need of two face molds for a half-space landing stairs where the branches are of different pitches. The books say there must be two molds used, and the diction of the authors has been universally accepted. At least I have never met a man who thought to the contrary. The practical manipulation of this problem, when dealt with intelligently, is a very simple affair. Refering to the sketches, Fig. 1 is the plan of a center line of rail and position of steps. A B is the pitch over first branch, having a tread of 10 inches and a riser of 7 inches. B C is the pitch over the return branch, with only 9 inches tread and 8 inches rise. Make D E equal to two of the return branch risers, or 16 inches, being a production of the second riser of second branch. Bisect the angle formed by the two pitches by a line, B F. Fix upon the position of joint at shank, say at A, and make B C equal to B A. In Fig. 2 draw the plan of a quarter of the rail as shown, and make F H B equal to F H B of Fig. 1. Make the pitch F B C equal to that of F B C of Fig. 1. H J is square with B C. J N is equal to O P. The bevel for the joint at J may be got by taking K as a center and with a radius touching a line drawn from L parallel to J K. Intersect L F produced at the point R. Connect R and K for the bevel as shown. No further explanation is deemed requisite.

Lining Shafting.

From S. R. K., *Grand Rapids, Mich.*—Some time since J. E. W. inquired about lining shafting. In reply I desire to say that there are as many different ways of lining shafting as there are millwrights. Many of them are as loose as the average millwright is a rough or careless workman. A great deal depends upon the position or location of the shafting. In the limited space which a correspondent can reasonably occupy in answering a question of this kind, it is almost impossible to give full instructions upon the subject. Hence, what I offer must be exceedingly brief.

Perhaps one of the best ways to line one shaft with another in the same room, where all the shafting is supposed to be level, is to drop the plumb-line over the siding of each end of the shaft to be lined from, and mark the points on the floor. Then, if there be nothing in the way, with chalk and line make a line on the floor, passing through these points, and long enough for the purpose. Call this the base-line. If there is anything in the way, measure from these points at right angles to the shaft to a place that is clear, and there establish your base-line. With a pole measure at right angles to base-line toward each end of the proposed shaft, a sufficient distance, and again mark the points on the floor, and make a chalk-line through them as before. In measuring do not use a tape or chalk line, as they are very unreliable. If the work is accurately done this line will be exactly parallel with the base-line, and as near under the proposed shaft as you desire. Then, by plumbing up from this line, or down from the shaft, it can be easily ascertained whether the proposed shaft is in line or not. Many millwrights set up a straight-edge at each end of the proposed shaft, plumb from this line, and are thus able to measure with a short stick from the straight-edge to the shaft in order to adjust it.

If the proposed shaft is to be at right angles to a given shaft, make a base-line as before, and mark a point, A, in the base-line under the proposed shaft. From this point A measure off each way on the base-line a convenient distance, say 8 feet, calling the points B and C. Now, with a pole and trammel heads, with first B and then C as centers, strike arcs of circles as nearly under the proposed shaft as may be. Then, with a chalk-line set in the point A, make a line passing through the points where the arcs intersect. This line will be the shaft-line from which the shafting may be lined as before.

If the proposed shaft is in a room below, after making the base-line, bore two small holes through the floor on the base-line, at the proper distance apart, and drop a plumb-line to the next floor, where the base-line can be drawn. Then proceed to draw the shaft-lines as explained.

If the proposed shaft is in a room above, plumb up from each end of the shaft to the under side of the floor, and bore a hole through the floor with a gimblet. This will give points in the room above for the base-line, when procced as already described. When the proposed shaft is in an adjoining room, the work is often a little more difficult to establish a base-line accurately, on account of the trouble of getting through the walls. A little ingenuity on the part of the operator will overcome the difficulty better than I could describe it here, especially as conditions would have to be imagined.

French Construction and Decoration.

From M. P. S., *Baltimore.*—I saw in France last summer a simple, cheap and effective method of laying floors. The appearance of the finished floor was that of marquetry. Ordinary oak or pine flooring in pieces about 3¾ inches by 18 inches long, were used. These were laid herring-bone pattern, like brick pavements, the ends coming over the lines of joist. In the Black Forest I saw houses shingled in the first story, vertical boarding in the second story, and red tiles for roofs. The shingles were painted cream color, the vertical boarding a warm drab, and the trimmings dark brown. The whole effect was very fine indeed.

Raising Truss Roofs.

From W. A. E., *Coral.*—In reply to W. B., of West Milton, Ohio, who inquires with regard to raising truss roofs, I would say the best way with which I am acquainted is to erect a gin pole of suitable strength and hight, with three guy ropes made secure for steadying it. Let the pole down 18 inches in the ground. Use blocks and falls with a sheave at the foot of the pole. Use a windlass to hoist. Hitch the block to the center of truss, and make fast a rope at each end of truss to balance it, and swing it into position when high enough to clear the plate. If the truss stands over posts, bore and put in heavy drift bolts, two in each and one inch square. If the truss does not stand over posts, put bolts through the truss and plates with the nuts upon the top side.

Hanging Window Shutters.

From W. S. H., *Lewisberry, Pa.*—I have a house the front portico of which comes between two windows, in such a manner that one-half of the blind from the adjacent windows in swinging back, comes in contact with the corners or gutters of the porch. I desire to know the best plan for arranging the shutters under these circumstances, and accordingly will be obliged if some of the readers of the paper will give me the benefit of their ideas. I thought I might split the shutters on each side of the porch that opens against the roof and fold it when open, but this, it strikes me, would not look well unless all the others were arranged in the same manner. It would be quite inconvenient to have all the shutters above and below to fold up when open.

Note.—The case mentioned by our correspondent is one that frequently occurs in building, more especially in the alteration of old houses, and the best method of proceeding in such cases depends very much upon circumstances and the taste of those directly interested. By means of some of the improved blind hangers now in the market, the shutters could be arranged to swing from the top in the shape of an awning, which might be satisfactory for the two windows near the porch, or a bracket might be put from the side of the house to receive and hold the shutter which could not swing clear open. These two suggestions have occurred to us since reading our correspondent's letter, and we offer them for what they are worth. If our practical readers will reply to our correspondent's questions, we shall be pleased to publish their letters.

Sheet Iron Roof for a Foundry.

From L. R., *West Winfield*—I desire to inquire if sheet-iron roofing, painted on both sides, will make a good practical roof for a foundry. If not, will it last longer if roof-

ing felt of some kind is put under the sheet iron. If this will not answer, what will make the best roof for this purpose? The pitch of the roof is 1¼ inches to the foot. The roof is over the molding room and at present is covered with gravel. It leaks badly and the owners of the property wish me to lay an iron roof. My reply has been that I do not think tin and iron roofs last well over such buildings.

Answer.—There are very few more trying positions for metal roofs than over the steaming sand heaps of a foundry. The gases and cinders from the cupola also have their effect in destroying a metal roof. From the pitch of the roof, as given by our correspondent, it would seem that there is but little choice in material from which to make the roof. Gravel and composition, tin and iron are about all that are available. Since the owners of the building have had experience with gravel roofs, they probably are not anxious to repeat a trial in that direction. While a gravel or composition roof, thoroughly laid, has its own peculiar merits, we are not prepared to advocate that style of roof as against metal roofs, even in view of all the difficulties that attend them. A tin or sheet-iron roof, properly constructed, can probably be made to answer a good purpose in the position named. The construction to be employed should be as follows: Sheet the roof with sound matched stuff, making a tight job. Over this lay roofing felt or building paper of good quality, and above this put on the iron or tin roof, using the best possible workmanship and, of course, employing good material. Both surfaces should be thoroughly painted and the paint should be renewed often enough to keep it in good condition. A roof laid in this manner, we think, would answer a good purpose. If any of our practical readers have suggestions to offer in this direction we shall be pleased to hear from them.

Contents of a Tapering Log.

From G. C. L., *New York.*—My attention has been called to the letter of C. J., of Brooklyn, approved by E. L. M., Cooksport, as to the amount of stuff he got out of a log 12 inches in diameter at one end, 6 inches diameter at the other, and 30 feet long. I cannot get 9 boards, 9 by 10 inches, 25 feet long out of such a log, nor can I get 225 feet, as is stated by the correspondent and apparently approved. I refer to the discussion which took place in the September number of last year. I inclose some figures of log and timber measure as I understand it, which bear upon this case. I would like to hear further upon this subject.

Note.—This correspondent seems to have taken C J.'s letter literally. We did not understand C. J. to say that he could get nine boards 10 inches wide and 30 feet long out of the log in question. He makes the statement, however, that a certain proposition is equal to 9 boards 10 inches wide and 30 feet long, and proceeds to say that the contents of the log in board measure are 225 square feet. The figures inclosed by this correspondent give the same conclusion, as we understand him, the only difference being that he cannot get the boards of the size that he understands C. J. to mention. We think the difficulty is simply a misunderstanding of terms. It is manifestly impossible to get a board 30 feet long and 10 inches wide out of a log which is only 30 feet long, one end of which is 12 inches in diameter and the other 6 inches. There is a difference between the actual contents of this log in board measure and the workable lumber that may be got out of it.

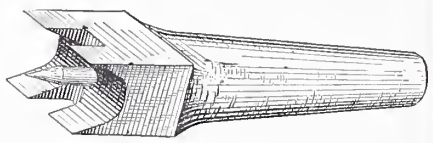
Turkish Baths.

From R. C. H., *Sylvan Springs, Ark.*—I should like very much if you would give me a full description of a Turkish bath, and how to make one.

Note.—Our correspondent apparently considers a Turkish bath a vessel of some sort to be made out of tin. It is, however, a very different affair, and should be, when properly arranged, more like the ancient Roman bath than anything else. The Turkish bath may perhaps more correctly be termed a system of bathing, comprising, as it does, hot and cold rooms, sweating rooms, cold and hot plunge baths, and, in some establishments, both cold and hot shower baths. Such an establishment requires an abundant supply of water, furnaces, boilers for heating water and a very considerable amount of apparatus in order to obtain perfect results. The true Turkish bath is, in some respects, like the Russian vapor bath, depending largely for its efficiency upon the production of a very profuse perspiration, after which the body is thoroughly rubbed, so as to remove the dead skin and perspiration from all parts of the body. This, of course, necessitates a sweating room which can be brought up to a high temperature, and in which a moistened atmosphere can constantly be maintained. Here, after remaining for a time, a profuse perspiration breaks out. This is kept up for awhile, and then washing, rubbing and often a sloep follows.

Spur Chuck for Wood Turnings.

From Francis H Richards, *Springfield, Mass.*—In the accompanying sketches I show a spur chuck for use in wood turning that is specially designed for holding small pieces of soft woods without splitting them. It will be



Spur Chuck for Wood Turning.—Fig. 1.—General View.

noticed that the four spurs are parallel on their outer surface, while their inner surfaces are of such a slant as to give them the requisit strength. This form causes the compression of the wood between the spurs, as shown in Fig. 2, but does not spread the portion of the wood outside the spurs. This tool I have had in use, to a limited extent, for many years, and others have also em-

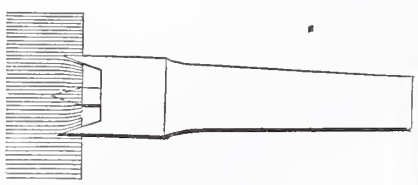


Fig. 2.—Side Elevation, Showing the Compression of the Grain.

ployed it. I believe, however, it will be new to many of the readers of *Carpentry and Building*, who will find it a valuable device for the purpose. It will be found specially desirable for use by pattern makers, its particular advantage being that it does not split the wood.

City vs. Country for Learning Trades.

From G. N. C., *Hancock, N. H.*—There are two sides to the question. I have had experience in both city and country, and have learned much in both places that can-

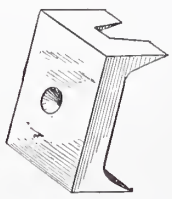
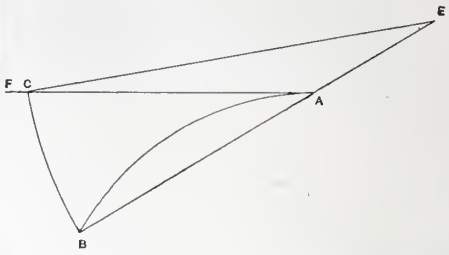


Fig. 3.—Cutter for Holding two Pieces for Turning.

not be otherwise than useful. To succeed in the country a person must be a natural mechanic with confidence in himself and full of native resources. In the city a man who is first-class in some one special branch will succeed where he would starve in the country. To illustrate, within two years I have built 4 dwelling houses, 2 farm barns, a lumber and grist mill, a railroad water tank, 3 two-story bay windows, 2 flumes for water wheels, including the setting of the wheels, besides doing a large number of smaller jobs, such as piazzas, conservatories, including a silo for storing green fodder. Now, this wide range of work requires a practical knowledge that cannot be obtained where work is divided as it is in most cities. There is one great disadvantage, however, in the country, which I look to *Carpentry and Building* to help overcome, and that is the difficulty of keeping posted in the matter of styles of finish, hardware, &c. To sum up, I would say to a young mechanic who intends to settle in the city, go to the



Squaring the Circle.—Method of Drawing a Straight Line Equal to a Given Arc.

country for a year or two and to the country chip. Then try one or two seasons in the city. In both places keep your eyes and ears open, study, read and think. When you know a thing, if possible know why it is so, even if it involves climbing high up into the branches of the geome-tree.

Squaring the Circle.

From Robert Grimshaw, *Philadelphia, Pa*—There is one problem very often presented in laying out gear, especially where there is a rack to mesh with a spur wheel or a pinion, and that is "rectifying an arc." It is about as near to the impossible "squaring the circle" as approximation permits. It consists in stepping off upon a straight line tangent to a given circular arc the exact length of the arc, or, conversely, stepping off upon a circular arc the exact length of a given straight line. This problem may be solved on the drawing-board by geometrical construction, with an approximation closer than men can work with ordinary tools.

Suppose that A B in Fig. 1 is a circular arc, and that it is required to find upon the tangent A F its exact length. It is done as follows: Draw the chord A B and produce it to E, making A E equal to one-half A B. With center E and radius E B describe the arc B C, cutting A F in C. Then the straight line A C equals the arc A B, provided the latter does not exceed 60°.

To get the length on a circular arc, as A K, Fig. 2, which shall be equal to a given

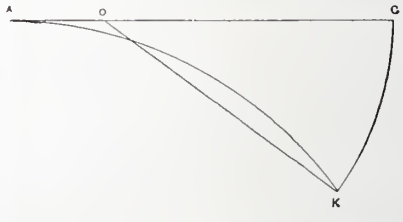


Fig. 2.—Drawing an Arc in Length Equal to a Given Straight Line.

straight line—for example, A C, tangent to that arc—lay off A O equal to one-fourth of A C. With radius O C equal to three-fourths of A C, from O as center, draw an arc C K, cutting the circular arc in K. Then the arc A K will equal the straight line A C.

Policy of the Paper.

From E. C. B., *Winsted, Conn.*—Please let me apologize to A. W. W. for the reference I made to the intellectual portion of his anatomy. I meant no offense. I would like to add, for his information, that "put that in your pipe and smoke it" is the classic for, to receive into the inner consciousness, to ponder over and profit thereby.

Length of Rafters.

From W. E. J., *Fairbault, Minn.*—I do not think that S. O. E. has got the best of your correspondent, D. M. W., on rafters. I think that a word or two would not be amiss on the rafter question. I would say that a third pitch roof is just 8 inches to the foot to start with, and that a quarter pitch is 6 inches to the foot. Dividing the width of the building by 3 or 4, as the case may be, will give the correct results, or set the roof at any other pitch and take the square and pick the figures on the tongue for 2 foot run, or 1 foot, as the case may be, and laying the square on the pattern piece, say a third pitch, 16 inches and 24 inches. This will give the plumb and level line. Commence at the top of the rafter and work to the bottom, marking down the plumb line at the end of the square. Then slide the square along, placing 16 inches at the end mark, and repeat until the base line measures one-half the width of the building. By this method a mistake is never made in framing rafters. The carpenter does not need to know the length of them. What is a queerer thing for some carpenters to hear is that a man may be ignorant of the length of the rafters he is using on a roof. If it is really necessary to know the length, measure one. It will be discovered, however, if they have been calculated as above, that they are always long enough. I think I am safe in saying that I have not known the length of a rafter that I have used during the last 10 years. They have all been just right. By my plan no figuring of square root and no drafting the length of rafter is necessary. I measure the base and plumb line only.

From D. W., *Caledonia, Michigan.*—Your correspondent, S. O. E., claims that the third pitch means 7 inches rise to the foot. I am sure he is wrong, so far as the practice in carpentry is concerned. He may be right with respect to trigonometry. In this respect the third of a quarter of a circle is meant, but that is the practice in mechanics. In carpentry, third pitch means the rise is one-third the width of the building.

From J. C. R., *Carthage.*—I have been much amused at the attempts made by some of the practical mechanics among the readers of *Carpentry and Building*, in obtaining the length of rafters on a roof having a span of 18 feet and one-third pitch. When it is considered that some of the readers of the paper are just learning their trade, all should make their explanations as plain as possible whenever a practical topic is being discussed. By the expression that a roof is one-third pitch is meant that the rise should be equal to one-third of the span. If the span is 18 feet, the rise must be 6 feet. Now in order to get the length of the rafter, draw a horizontal line 18 inches long, that is, 18 feet long by the scale of 1 inch to the foot. This line will represent the span. From the center of this line we will draw a perpendicular to it 6 inches long, representing the rise 6 feet, by the same scale. Now, by measuring from the top of the perpendicular to either end of the horizontal line, we will have the length of the required rafter. This is an old and infallible method applicable to roofs of any rise or span. It always gives the correct length, which in this example is 10 feet 9½ inches.

From C. M. A., *Keokuk, Iowa.*—I notice quite a number of the readers of *Carpentry and Building* are trying to find the length of rafters for different pitches of roofs. I desire to remind them that 7 and 12 on the square will never cut a rafter for a third pitch, but that 8 and 12 are the correct figures for the purpose, while 6 and 12 in turn are correct for quarter-pitch.

From J. H. M.—I think that S. O. E. is mistaken when he says that 7 and 12 on the square gives one-third pitch instead of 8 and 12. I also think that a hexagon miter and a third pitch are two different things. For a half-pitch roof he takes 12 and 12, and for a third-pitch, 7 and 12. Now the difference between one-third and one-half is one-sixth. Therefore, the one-sixth must equal the difference between 7 and 12, his third pitch, and 12 and 12, his half pitch. This he shows to be 5 inches. If the half pitch be divided into three equal parts, every part will equal one-sixth, and according to S. O. E., the first sixth from the base line will be about 3 inches, the second one 4 inches, and the third one 5 inches, making in all 12 inches for the half pitch. Yet every sixth is of different altitude. I will be obliged to S. O. E. if he will make it clear to me why they do not measure alike. So far as getting the miters for octagon and hexagon figures, his diagram is well enough, but I do not think that octagon and hexagon will answer for one-fourth and one-third pitch. I call 8 and 12 one-third pitch, and I cut my rafters accordingly. S. O. E. calls 7 and 12 one-third pitch, and very likely he cuts according to these figures. I therefore think the only thing to be settled is, which figures are right?

From C. E. P., *Tampa, Florida.*—I have noticed the communication from S. O. E. on roof pitches. I have always worked upon the supposition that the terms one-third, one-fourth, &c., were taken as those fractions of the width of the building. For illustration, if the building is 24 feet wide and the roof is to be one-third pitch, I understand the term to mean a rise of 8 feet. So that for our rafters we would have a run of 12 feet and a rise of 8 feet, or, in other words, 8 inches rise to the foot of run. With one-fourth pitch the rise and run would be determined in the same way. The length of the rafter with the bevels may be found by taking the rise 8 inches on the tongue of the square, and the run 12 inches on the blade. Carry this through to one-half the building, which is 12 feet. The bevel on the tongue gives the down bevel on the top of the rafter and that on the blade gives us the plate cut. This is a rule by which I have worked rafters for 26 years, and if I have been wrong all this time I would like to know it. I get the length of hip rafters for hip roofs in a similar way, with the exception of making a draft of the hips to get the seat of the jack rafters. I get their length and bevels the same way as for common rafters.

Besides the communications above published, we have numerous other inquiries and notes called out by the letter from S. O. E., but of the same general tenor. Our space does not permit the publication of a larger selection.

Comparative Cost of Buildings.

From M. P. S., *Baltimore, Md.*—It may interest some of the readers of the paper to compare the cost of building in Baltimore with the cost in their own localities. Having recently erected three cottages of different styles, I give below a deseription of them, with figures. I would state that the accounts were kept with unusual care, and that the results may be relied upon as strictly accurate.

Cottage No. 1 contains 14 rooms, large and small. It was begun January 29, 1880, and finished and occupied June 1, 1880. The dimensions are 38 feet front, 37 feet deep, 2 stories high and an attic. The foundation was of stone and brick. The cellar extended under the whole house, and was 8 feet deep in the clear. A basement kitchen was provided. The first story was 10 feet 6 inches high, containing 3 rooms and a hall. The second story was 10 feet, and contained 4 rooms and bath. The attic was 8 feet, and contained 4 rooms. The plan was somewhat irregular in outline. All the materials and workmanship were of the first quality. Framing lumber was Virginia pine, sills 6 x 8 inches, corner studs 4 x 4, other studs 2 x 3 and 3 x 4. The joists employed were 2½ x 8 inches, placed 16 inches between centers. The rafters were 2 x 6 inches, placed 20 inches between centers. The roof was covered with cypress shingles. The framing was of the style known as balloon framing. The weather-boarding was of the best quality, ⅞ inch, dressed, tongued and grooved, cypress 6 inches wide. The interior was ornamented with 6-inch band and window trimmings, and was painted 3-coat work. In the design there were 3 ornamental gables, 1 portico and 2 bay windows. The interior was finished as follows: All doors and trimmings were of cypress, molded to pattern This wood, I would remark, has handsome grain and color, and I have found, after two years' trial, that it stands quite as well as pine. The finish was oil and varnish. The library, hall and dining-room ceilings were also of wood, being made of ⅞-inch cypress, nailed to the joist and paneled with walnut and mahogany. The walls and other ceilings were plastered two coats brown mortar, and troweled smooth for papering. All floors were of narrow Georgia and Virginia tongued and grooved flooring, smoothed, stained and varnished. The house was provided with three chimneys. Open fire-places were placed in each room, finished with hard wood mantels and Minton tile hearths. The parlor mantel was ebony, the library walnut, the dining-room and chambers ash. The plumbing consisted of a well 24 feet deep, and force pump, bath and water-closet, with hot and cold water on the second floor. Gas pipes were laid throughout. The house was papered from the attic down. Staircase was of Georgia pine, with ash newels, rails and balusters.

The cottage above described is considered one of the prettiest in this vicinity. The work was done by the day, and the wages paid were as follows: Carpenters and plasters $1.75 per day, painters $2 per day. The architect's measurement of the building showed the cubic feet to be 39,500. The cost figures, at 11 1-10 cents per cubic foot, as follows:

Excavation	$44.90
Foundation	253.18
Chimneys	193.33
Lumber	838.40
Mill-work	834.56
Plastering	213.65
Painting	235.60
Carpenter-work	850.30
Hardware	99.79
Nails, &c	99.53
Glass	49.24
All other items	670.52
Total	$4,383.00

The second cottage was begun December 10, 1881, and finished April 20, 1882. The dimensions were 32 feet front by 34 feet deep, with a one-story kitchen addition, 12 x 18 feet. The main building was two stories high, with an attic. The total hight was about the same as the first house. It was framed in the same manner. The roof was covered with the best quality of peach-blossom slates. This house contains 13 rooms. The first story is weather-boarded with white pine. The second story and gables are covered with California red-wood shingles dipped in linseed oil before being laid. The interior finish is poplar molded to pattern, stained mahogany color, oiled and varnished. All the ceilings of the first floor are of wood, Georgia beams, dressed and chamfered and finished in oil, panels being poplar shellacked. There is one large chimney in the center of the house, constructed of pressed and molded Peerless brick. There is a fire-place in the hall, also open fire-places in dining-room and parlor. There are no fire-places in the chambers. The house is to be heated by a furnace throughout, although the furnace is not yet put in. The plumbing employed was the same as in the house already described. Every room in this house is handsomely papered. All the floors are laid with Georgia pine, stained and varnished. Staircase is of Georgia pine, with cherry newels, rails and balusters.

This building was also erected by day's work. The carpenters received $2, the painters $2.50 and the plasterers 10 cents per square yard for labor. By the architect's measurement this building contains 32,000 cubic feet. The cost was 11 6-10 cents per cubic foot, as follows:

Excavation	$50.25
Foundation	272.29
Chimney (not including mantel)	131.77
Hard wood mantel	61.11
Lumber	800.95
Mill work	395.00
Plastering	144.82
Painting	247.85
Carpenter work	735.12
Hardware	94.90
Nails	45.00
Glass	34.00
All other items	688.00
Total	$3,701.06

Considering the finish of these cottages, this showing is favorable. The third cottage in question is a simple rectangular frame, 16 x 30, two stories high, 10 feet in the clear respec-

tively. There is no cellar under it. Brick fonndations are employed, covered with asbestos felt. The extension is weatherboarded with white pine, and painted three coats. It is plasterecl two coats brown mortar. The architect's measurement shows the cubic feet to be 14,400; the total cost $756.36, or 5¼ cents per cnbic foot.

REFERRED TO OUR READERS.

Arched Gateway.

From E. P., *MeHenry, Ill.*—I wonld like to see in *Carpentry and Building* a design for an arched gateway suitable for nse in connection with a cemetery. It is to be employed in a plain picket fence.

Construction of Buildings.

From W, P., *West Milton, Ohio.*—I desire information, and I believe that others as well as myself will be benefited by answers to my questions. I desire to know if the bnilding as indicated in the inclosed sketch will be thoronghly practical? A represents the foundation, B the sill, placed 4 inches back from the face of the foundation to provide a footing for the water table, C supports the brick D, which are laid in stretchers and fastened to studding E by anchor nails, a detail of which is shown in Fig. 2. These are driven into each stnd with the npper surface cvery fifth course of brick. F is the sheeting, G the furring, H the lath, I the plaster, J the base board, K the shoeing, L the flooring, and M the joists. If experienced correspondents will criticise this construction and present their views on the snbject, they will confer a favor.

Designs for Verandas.

From J. D. R., *Germania, Ohio.*—If some of the readers of the paper wonld forward designs for neat verandas, something new in style, I think they wonld favor many readers of the paper.

Bevel Gearing and Line Shafting.

From J. E. W., *Royalston, Wis.*—When I asked some time since abont bevel gearing and line shafting, it was information I wanted and not advice. If yonr correspondent G. C., who replied to my inqniry, had been competent to give the information desired, I think he would not have been quite as free with his advice. He shonld know that in the Western conntry snch men as he calls "practical engineers" are not as plenty as they are in the old Bay State, and that we are too far from the centers of education and experience to derive the benefits from them. I have heen employed most of the time for for the past two years in sawmills. It was in this direction that I needed the information for which I asked. Accordingly, I respectfnlly repeat my call for information on the snbject of gear wheels and line shafting. How shall I determine the size and pitch of any bevel gear, and how can I quickly and perfectly adjust line shafting?

Red Stain for Brick.

From L. L,. *Detroit, Mich.*—I will fee nnder many obligations if some of the practical readers of *Carpentry and Building* will fnrnish for pnblication a receipt for a dnrable red stain for brick. The stock brick mannfactnred in this neighborhood lacks nniformity of color, and the stain lacks durability. Hence my reason for asking for this information.

Defective Shingles.

From G J., *Ronson, Ont.*—I am building a honse for which there were ordered No. 1 clear shingles. When we came to lay the shingles, however, they proved to be no better than a good quality of culls. A great many of the shingles were shaky. The owner of the honse has conclnded to nse them against my advice. As they are fresh sawed, we cannot find all the shaky ones in order to throw them away. Accordingly I am afraid the roof will leak. Will some practical reader tell me the first best thing to do under the circumstances. Will painting help it? If so, what is the best material to nse?

Country Church.

From E. W. K., *Coote's Store, Va.*—I wonld like to see pnblished in *Carpentry and Building* a design for a small conntry chnrch, the roof to be trnssed, of qnarter pitch. With it I would like designs for a plain pnlpit, also a diagram showing the arrangement of seats. If any of the readers have bnilt desirable buildings of this kind they will confer a favor by sending their designs to the Editor for pnblication.

Manufacturing Flooring.

From C. P. W., *Detroit, Mich.*—I wish to inquire, throngh the colnmns of *Carpentry and Building*, with regard to oak and other hard-wood flooring, and the best machinery for mannfactnring the same cheaply on a small scale. What is the most satisfactory width and thickness to work hard wood for flooring? What power is required to rnn a 24-inch snrfacer and matcher? What power is required to rnn to good advantage a resawing machine to cnt 8-inch stnff?

Finishing Burl Panels

From E. A. K., *South Hope, Maine.*—Will some of the practical readers of the paper give a fnll description of the process of finishing a burl panel? I desire snch directions as will enable an inexperienced person to do the work with snccess.

Center of Gravity.

From W. B. H., *Hannibal, Mo.*—I desire to learn a practical method of finding the center of gravity of plane or sclid bodies when they are too bnlky to determine the point by balancing. For example, how shall the center of gravity be fonnd of a board 4 inches wide at one end, 12 inches wide at the other, and 24 feet long? I have been trying to determine problems of this kind by calculation and by lines, but so far have been nnsnccessful.

Door Casings.

From F. A. R., *Kendaia, N. Y.*—I shonld like to have some reader of the paper explain how to furnish door casings at the corners of the frame when the casings are headed so as to show a sqnare or circle where the head and side casings join. I also desire to know how to fix the bottom of side cassings where they have bases different from the principal base.

Strength of Pine.

From W. B. K., *Hannibal, Mo.*—Will some of the readers of the paper who have had practical experience, inform me what the breaking load of ordinary pine is. According to some anthorities it is 125 ponnds; others say 200 pounds, while I have heard it stated as high as 400 pounds. I desire reliable information upon this point.

Secretary and Bookcase.

From G. W., *Marysville, Mo.*—Will some correspondent of the paper give a plan for a secretary and bookcase? I desire something that is adapted to constrnction by an amateur.

Foundation Walls.

From J. C. R., *Mt. Vernon, N. Y.*—A mason in this locality claims that for the prevention of upheaval of fonndation walls by the action of frost, small rubble masonry, dry or laid in mortar for the lower course, is preferable to flat bedding stone. Will some of the practical readers favor ns with the results of experience in this direction?

Lathing and Plastering.

From C. M. A., *Keokuk, Iowa.*—I desire to learn throngh the paper with regard to lathing and plastering. Are dry lath better than wet lath for plastering? Some plasterers think wet lath are preferable.

STRAY CHIPS.

As a practical example of the fire-proof qualities of wood when properly treated, may be mentioned that wood joists are being employed in the construction of a building now in progress on Walnut street, above 4th, Philadelphia, in preference to iron. The construction employed is described as follows: The joists are stripped on the outside. Over these strips irons are run, and on these plaster is spread. The theory upon which this construction is based is that, in an ordinary fire, joists thus treated will he fire-proof, and only when the fire has reached such a fury that the building must be destroyed will they be at all affected. The special advantage claimed for them is their superiority over iron joists. When a building is being hurned by a furious fire, iron joists expand and crush out the walls, and do still other damage. Wood joists are simply burned up without injuring the walls at all.

English domestic villas have become popular, and plans are being drawn for one to be erected by W. L. Vandervort, of South Oyster Bay, L. I., to he built near the seashore, its construction being of wood, with ornamental chimneys in brick and terra cotta. One of similar design is to be built of red sandstone, at an expense of about $15,000, for W. J. Russell, of Short Hills, N. J. It will have three tall outside chimneys.

Contracts for a new court house at Escanaba, Mich., have been let for $20,270.

The plumbers of St. Louis have been attempting a strike, but with indifferent success. Their demand is for $3.50 a day instead of $3, the old price. The movement lacks vigor and enthusiasm, chiefly because the most of the plumbing firms in the city have agreed to the advance for the best class of workmen, while they refuse it to the whole body of men They insist upon paying men according to the value of their services, instead of a uniform scale by which the skillful and industrious man gets no more for his work than the shirk and the botch, who are dear at any price.

Appleton, Oshkosh, Green Bay, and other Wisconsin cities are indulging in new opera houses.

The granite paving blocks which form the sidewalks about the new Custom House, at St. Louis, are slowly being placed in position. The plastering contract was let some months since, but the slating on the dome remains but half finished, precisely as it was left more than a year ago. Government work goes slowly everywhere.

Plans for a new opera house at St. Paul, Minn, have been completed by a well-known St. Louis architect.

It is said that a Cleveland man will soon erect at Houghton Point, near Ashland, Wis., the largest summer hotel in the Northwest.

The Collector of Taxes in St. Louis has raised quite a stir among the architects of that city by making a demand on them to pay a license of $50 a year. He finds his authority in an ordinance, said to have been passed last winter by the city councils, regulating taxes, in which, with a discrimination worthy of the politicians who rule our larger cities, architects and civil engineers are grouped in the same class with traveling mountebanks, veterinary surgeons, circuses, and the like. Since the ordinance makes no provision for protecting architects who dutifully pay their $50 a year, by prohibiting unlicensed parties from furnishing plans and superintending, the architects have made a vigorous protest against the collection of the tax until the law is properly modified. At present, any person except an architect is at liberty to make plans and superintend buildings *ad libitum*, without restraint and without tax, but if a trained and thoroughly qualified architect wishes to do the same, he is forbidden until he has first paid his license tax. This is putting a premium on ignoraace and incapacity, and at the same time repelling science and training.

The contracts have been let for the Hammond Library Building, in connection with the Congregational Theological Seminary, Chicago. The building will cost $35,000.

Syracuse, N. Y., is said to have a female architect. Other towns, not so pretentious, can boast, however, of more than one designing woman.

The following, which is a carefully computed account of the materials used in the construction of the grounds and buildings of Pullman, will give some idea of the enormous amount of work which has been accomplished in that city since its founding: Number of yards of sand used, 100,000; brick already used, 35,000,000; brick yet to be used, 10,000,000; feet of lumber used to date, 25,000,000; barrels of cement used to date 35,000; barrels of lime used to date, 70,000; cubic yards of excavations, 100,000. The first house was leased on January 1, 1881, and on May 1, 1881, there were 62 families and 350 people. The number of families now living at Pullman is 726, and the total population is 5174 persons. The school census of persons under 21 years of age shows 1325, and between the ages of 6 and 21, 794. The number of houses in Pullman already finished is 764; houses unfinished and now in process of construction, 655; total, 1419. Number of miles of railroad track at present, 19; number of freight cars owned by the company and now in Pullman, 82; number of locomotives, 2. The water system of Pullman is able to supply 80,000 people the capacity of the large water-tank in the water tower being 500,000 gallons. The number of acres in the sewerage farm thoroughly piped and underdrained is 60; acres now in process of piping, 80; acres used this year in connection with the farm, 700: machines in use in the brick yard, 11; brick molded by the machines last year, with five machines, 7,750,000; brick molded this year, with 11 machines, 9,500,000; full daily capacity of machines, 220,000; horse-power of the two yard engines, 250; number of men employed in the yards, 260. The number of gas meters set in Pullman is 900; lamp-posts already set, 200.

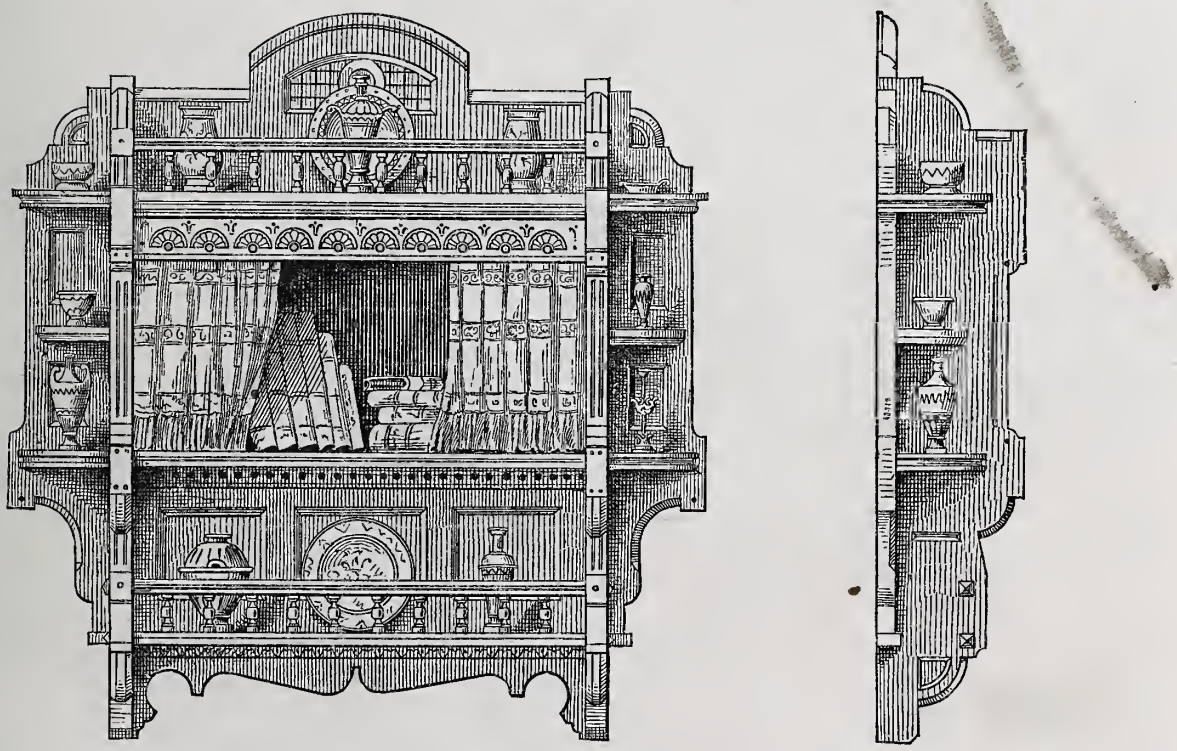
CARPENTRY AND BUILDING

A MONTHLY JOURNAL.

VOLUME IV. NEW YORK—OCTOBER, 1882. NUMBER 10

Design for Wall Cabinet.

We take pleasure in presenting to our readers a design of a wall cabinet contributed by Mr. Cicero Hine, of Ottawa, Canada. Details of ornamental portions showing construction will be found on the following page. In this design the artist has happily combined several features. The judicious introduction of a very small amount of carving gives life to the design, while the disposition of the drapery which shields the bookshelf also serves a useful purpose. Cabinets of this general description are at present very popular in houses of both high and low degree, and therefore a design adapted to construction by carpenters and amateurs is always of interest. With reference to the woods of which this cabinet might be constructed, there is little to be said other than what has appeared in these columns in connection with similar articles in months gone by. If constructed of cherry or other suitable wood and carefully ebonized, a very handsome effect will be produced. It would look equally well, perhaps, in some of the native hard woods finished in oil. If worked in walnut carefully filled, a very rich appearance would be presented. Our readers have the choice of several different varieties of wood, and several different styles of finish for working an article of this kind, and may rest assured that whether they make it for the purpose of decorating their own walls or as a present for a friend, or in the hope of selling it for gain, it will prove satisfactory in all respects. Not a little of the effect to be derived from an article of furniture of this kind is dependent upon the ornaments which it serves to carry. The artist in this design has used bric-a-brac sparingly and yet with good effect. In the choice of articles for this purpose attention should be paid to color, in order that suitable contrasts between the pieces displayed and the woodwork of the cabinet may be had. The drapery, as will be seen by reference to Fig. 5 of the details, is run on a rod by means of rings placed just back of the hanging piece over the bookshelf. Rings for purposes of this kind can be purchased at almost any of the hardware or picture stores.



Design for a Wall Cabinet, Contributed by Cicero Hine, Ottawa, Canada.—Fig. 1.—Scale, ¾ Inch to the Foot.

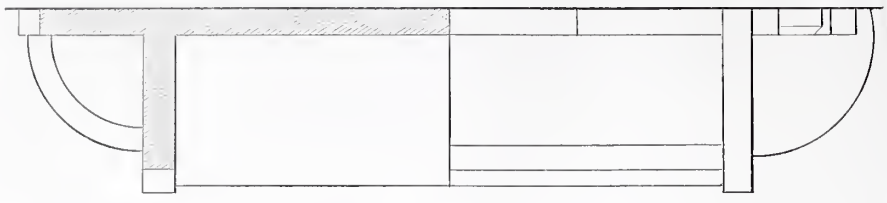
Colors for Painting Buildings.

The proper tint for painting a building seems to be a question left entirely to the taste or the caprice of the owners or architects of buildings. If green, blue, red or brown happen to be the fancy of the leading real estate owner in the town, his buildings are all painted in those colors, and as a matter of course everybody else follows suit. After one color has been used for a half dozen years or more, somebody who happens to have a goodly building to paint concludes that he will no longer follow the fashion, but will try some experiments, and immediately afterward everybody tries the same experiment. The question arises, What color is best for a building? To answer that question in the city of New York, some years ago we undertook a careful examination of leading buildings, especially those of which we happened to know the date of painting. New York has tried almost everything in the way of color, including black, white, red, blue, green, and neutral tints. Of course taste must after all these efforts, be the ultimate critic, but durability should by no means be despised, and it happens as a curious coincidence that those colors which will give the most desirable results, will also be the handsomest. We may, perhaps, be permitted to lay down some rules for the painting of buildings which hold in force in all parts of the country, and which, if strictly applied, will give different tints in different towns. First, we want the best color in itself, and also that which shall look the best under the dirt and dust effects of any climate. In and about New York the dirt is red. Further south, in Jersey, there are points where the prevailing color of the dust is whitish yellow. In other parts of the country a blue-gray dust arising from the clay is prevalent. To the westward we have the dingy blackness of the coal smoke. Now in selecting paint, it is necessary to choose one upon which the dirt shall have the least possible effect.

One plan, which has been tried in New York, is to obtain a color as nearly identical with that of the dirt as is possible, with the idea that if this is accomplished the building will not show the dirt. The result of this is as completely opposite to that desired as it is possible to conceive. The first shower of dust falling upon the building instantly dulls the color, and it takes only a few weeks to make the whole appear as though the dirt was its only covering. The warm or reddish dust of New York City seems to have incorporated itself with all the red or warmly colored paints, and destroyed their newness almost before they have had time to properly dry. Careful inspection of some of the principal streets of New York has developed the fact that all those buildings which are painted brown, red, warm dove colors, or, in fact, any other color having any considerable amount of red in it, are, almost immediately after being painted, dull and dingy. In some instances, before the first season has passed, they appear like buildings long painted, in spite of the fact that the paint coating, so far as its protective power is concerned, has not been injured. On the other hand, paints containing blue, yellow or green in considerable proportions hold their brightness even when the building

is rather dirty. The dirt, it is true, shows upon the surface, but the paint looks bright beneath it. Here, then, we develop a rule for places in which the dirt and dust has a decided reddish tone, and that is to use colors having a large proportion of green in their composition. Yellowish olive green and even the lighter blues will usually look well in such situations. By this we mean that the paints will appear bright until the paint is so dry as to make it necessary to repaint. In a country where a blue or bluish-gray dust prevails, precisely the opposite course should be pursued. There the orange shades will be found the most valuable, in fact the reds or the yellows can be used indiscriminately. We may remark by way of parenthesis, that when we say red or yellow we do not mean vermilion, ultramarine or chrome yellow, but those tints and shades which approach the red or the yellow in their character. In house painting pure colors are an abomination, as they are in art of all kinds. We might almost say that the pure color is never beautiful under any circumstances; certainly we know of no case where it is found in nature, and in none of the fine artistic examples of color that we have ever seen, has such a thing occurred.

Probably the Western country, deluged as it is in many parts by coal smoke, can indulge in brighter colors than the East or the South. We are not familiar enough with the effects of the smoke upon colors to decide what one will give the best results, but we imagine that it will not be difficult to find a range of yellows which will look bright even under a considerable thickness of coal smoke. The Ohio stone, the beautiful, yellowish green stone so much used in and about Philadelphia, should be admirably adapted to Western usage, and in New York City would far better resist the damaging effects of the dust than our brown stone. There is a red conglomerate much used in Boston, which is one of the handsomest building stones we have ever seen, and could hardly be improved in color for that part of the country, where the dust is of a blue-gray character. The same stone, however, when used in New York, seems to lose its brilliancy and becomes at once like the red sandstone, an ugly, disagreeable brown. This, of course, is entirely due to the fact that the dirt here is red. In those portions of the country which are well watered and have very little dust, we are hardly limited in the colors which we can use in painting our buildings. One thing, however, it is well to bear in mind, and that is, the most charming colors are those which are the most mixed; in other words, if we have blue it is all the better for having a little red and a little yellow in it, like the colors of a Japanese fan. The red should have a dash of blue and also of yellow, and the yellow is decidedly improved by being slightly mixed with the other two. When seen in the pot the uneducated eye is prone to call such mixtures dirty. They are certainly dull, and to many far less pleasing than pure blues or yellows or greens, but when we have to use them and contrast them with other colors they are far more effective, and at once develop a brilliancy which is quite astonishing. In regard to the color of moldings and trimmings of buildings, it may be well for the painter to bear in mind that his bright colors, which he uses for setting out his building, must be sparingly used, and that to preserve their purity it would be well to select such members as are somewhat protected from the weather. In this way their brilliancy will remain effective for a much greater length of time than if they were exposed to the full glare of the sun or the dripping from the eaves.



Wall Cabinet.—Fig. 2.—Horizontal Section and Top View.—Scale, 1 Inch to the Foot.

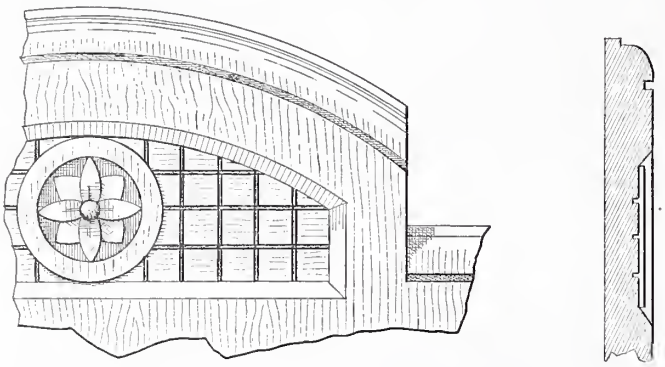


Fig. 3.—Detail of Panel in Back —Scale, 3 Inches to the Foot.

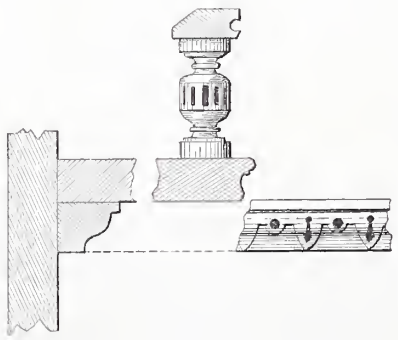
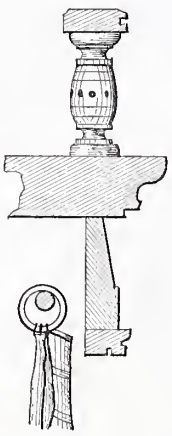


Fig. 4.—Detail of Lower Spindle Course.—Scale, 3 Inches to the Foot.



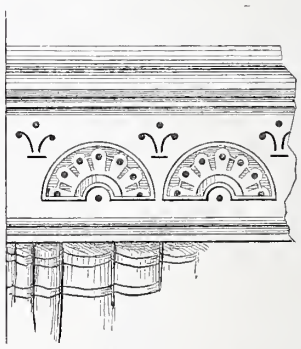


Fig. 5.—Details of Upper Railing and Draping.

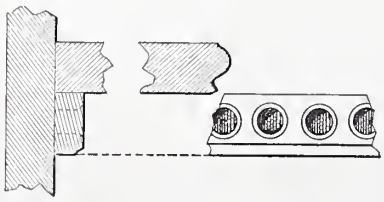


Fig. 6.—Finish of Principal Shelf.

Society of Architectural Iron Manufacturers.

The above is the title of a society which has recently been established in this city for the purpose of advancing the interests of the architectural iron trade, and with the view of promoting frequent interchange of ideas relating to the manufacture of architectural iron. At the first meeting, the following officers were elected: President, J. B. Cornell; vice-president, J. J. Burnet; secretary, A. J. Campbell; treasurer, Thos. Radley. An inspection of the constitution of the society shows that all persons engaged in the manufacture of ironwork for buildings in the city and vicinity, may, after being proposed and elected, become members on signing the constitution and paying an entrance fee of $25. Certificates of membership, which are to be transferable, will be issued, and each certificate shall represent an equitable share in the money and property of the society. Meetings are held on the second Monday in each month. It appears that the society will not attempt to fix wages or selling prices, and every member shall be entirely at liberty to employ whomsoever he may desire, and for whatever compensation he may deem best. The funds of the society even now amount to a considerable sum, and it will probably not be long before important additions will be made, both in influence and property.

Materials indestructible by fire must be more generally used in the construction of our theaters if we would avoid a horrible catastrophe one of these days. A recent inspection by the Fire Department authorities shows that most of them are very insecure. Combustible materials are found everywhere, and ordinary precautions are much neglected. Not one of them has an iron screen between the stage and auditorium, but several have automatic alarms and tanks of carbonic acid gas, which, it is said, have served a good purpose in several instances. On the other hand, the ceilings are highly inflammable, and an upward current of air from the stage and audience room are favored for purposes of ventilation. Iron ceilings should be universally introduced, and all parts of the building adjacent to the scenery and dressing-rooms should be absolutely fire-proof. In short, there will be no safety until our public buildings are made of iron and masonry.

Never strike a line when it is down.—No. String it upon a level with your shoulder, and give the line a chance.

The Seventh Competition.

The decision in the Seventh Competition is referred to the readers of this journal. Our object in offering prizes for specifications has been to obtain one that would be generally accepted as adequate for the purpose. Since it is to become the basis of the Eighth Competition, the subject of which is the estimate of cost of building the house illustrated in the July number of this journal, it seems entirely appropriate that our readers should have the opportunity of indicating their preference in this matter. Accordingly, five of the best specifications received in this competition will be published in full, and the award of prizes will be made in accordance with the preferences of our readers as expressed by ballot. The *noms de plumes* of the five specifications to be thus published are as follows: "Midnight Oil," "Willingly," "Star," "Jumbo" and "Fides." As we find it impossible to devote sufficient space to these in one issue, we publish three of them herewith, and will give the other two in our next number. The ballot for voting in this decision, will full instructions, will be found in the advertising pages of this issue.

The conditions to be observed in voting are as follows: No ballot will be counted that is received before November 6, and none will be counted that reach us later than November 20. The ballot is printed in this issue, and the object of refusing to count those received earlier than November 6, is to insure every one reading the specifications which will be published in our November number.

We trust our readers generally will give this subject careful attention, and will vote just as they think right under the circumstances. The specification receiving the largest number of votes under the conditions above named will be awarded the first prize in this contest, namely, $50. The specification receiving the second highest number of votes will receive the second prize, $30, and the specification receiving the third highest number of votes will receive the third prize, $20.

The specification receiving the highest number of votes will be the one which will form the basis of our Eighth Competition, which is a detailed estimate of the cost of building the house. Further particulars concerning this, with all necessary information about the price list of materials on which the estimate is to be based, will be published in the December number.

If our readers should find anything about the specifications we shall publish that they may regard as out of place in such writings, especially when prepared for publication, they must remember that it would be improper for us to alter or abridge anything submitted in competition. Therefore we submit them just as received. We throw the matter of decision into the hands of our readers, and they must decide by balancing the merits and demerits of each, casting their votes for the one which, on the whole, seems best for the purpose.

"FIDES"

SPECIFICATION

Of Workmanship and Materials to be Used in the Erection and Construction of a Dwelling to be Built in ———, for ———, According to the drawings Prepared by E. S. Hammatt and the Specifications Prepared by "Fides."

Excavation.

The entire area occupied by the building to be excavated for a cellar 8 feet deep from floor to floor, level trenches to be carried down 12 inches below this level for all foundation walls, deeper if at any point required to give a satisfactory foundation. The entire area of the cellar to be paved, on a 4-inch bed of clean sharp sand, with good hard dark-red brick, laid on edge, herring-bone.

Masonry.

The exterior foundation walls are to be built of good local quarry stone, of suitable sizes, and free from all surface stone; at least one-quarter of the stones must be headers, of sufficient length to reach clear through the walls. All the stones must be laid on their beds, solid and well flushed with mortar. The exterior stones above the ground must be squared, the joints properly raked out, and on the completion of the work the joints must be pointed with best red pointing mortar; in the interior the joints must be struck smooth. The walls are to start with a 6-inch course of stones 2 feet 8 inches wide, with good beds and builds, and are to be solidly bedded in sharp sand and well rammed. All the walls must be built to a line inside and outside, thoroughly bonded, plumb, out of wind, and brought to a proper and uniform level. The earth to be filled in around and properly rammed to all the walls as the work demands. All the earth arising from the excavation, as also all rubbish of any kind whatever during the prosecution of the work, not used in grading or leveling on the premises, is to be removed and the whole to be left clean and scoured on completion of the work. Excavate also two cesspools and a well, each 5 feet in diameter, to a good and satisfactory flow of running water. They are to be placed where directed.

Cut Stone.

The coping of the cellarway, the lintel for the same, which is to be cut with a rib, the cellar window sills 5 x 8 inches, and the bottom step of all exterior or cellar steps, are all to be of the best quality of clear granite and finished in fine 8-cut work. All the stone steps are to have approved scrapers leaded in. The latter stones are to be set on an 18 x 18-inch foundation piers of hard brick laid in cement mortar and 3 feet below the finished level of the ground. The window sills are to have a cut bevel or wash of ¾ inch in 8 inches.

Brickwork.

The various division walls of the cellar, the chimney breasts, flues and their chimneys and the various piers of the porches or foundations of the steps are all to be built of the best quality of hand-made brick, laid in thorough bond with headers every five courses, solid, rubbed up and cross-jointed. All the brick used on the exterior above the ground to the top of the first floor of joist, are to be of the best quality of dark-red sand-brick, all used below the ground and to the top of the first floor of joist on the interior are to be arch or black brick; same for all trimmers. All used for the lining of fire-places or the paring of hearths, are to be best dark dust-pressed bricks, and for the balance good hard unwashed salmon. The flues are all to be capped with chimneys of good hard dark-red brick, laid in ornamental pattern as indicated. The exterior brickwork is to have cut joints and to be laid in red mortar. All the various fire-places and flues to be constructed as shown, and the latter thoroughly pargeted smooth on their inside. The stone, as well as all the brickwork, is to be laid in mortar composed of fresh, well-burned lime, mixed in proper proportions with clean sharp sand. The red mortar to be prepared as directed; where necessary, the exterior brickwork is to be cleaned and oiled on completion. (For paving, see cellar.) Place cast-iron frame and flue door at the foot of the furnace flue. No wood, brick, framing or furring strips of any kind to pass into or be lodged in any flue within 4½ inches of such, or any fire place. The framing for all flues and fire-places is to stand off at leat 1 inch from the same and the intervening space to be filled with plaster of Paris.

Ironwork.

The exterior cellar door is to be made of ¼-inch plate iron in two folds, and hung with substantial hinges and secured on inside with stout swivel bar. The angles of the various hips and valleys of the roofs are all to be lined with 4-pound milled lead, put on in courses to suit the slate and of sizes as indicated. All the roofs are to have standing gutters formed of 6-4-inch clear and seasoned white pine, supported by wrought-iron counter-sunk knees. The fall in the same to be formed by a beveled strip. The gutters are to be lined and the down spouts constructed of the best quality of X tin, bright charcoal, thoroughly painted on the underside and secured with substantial tinned nails. The same material is to be used for the flashing (which includes all molded strings and heads of window and door casings), which is in all cases, where practicable, to be counter-flashed. The various down pipes are to be in size from 2 to 4 inches in diameter, according to the location and direction. At the ground they will be connected to a cast-iron waste, which will be connected with one of the cesspools. The various trimmers in the framing of the floors are to be hung with ½ x 2 inch wrought-iron stirrups. Furnish and place in position all the various tie or anchor irons or bolts that may be required or directed, the same to be of the proper shapes and sizes.

Terra Cotta.

The crestings and finials of the roofs are to be of a selected design of terra cotta. It is also to be carefully secured in place.

Slate.

All the various roofs are to be covered with the best quality of peach bottom slate, of approved size and color, laid with 4-inch lap and secured with tinned nails. The roofs and cheeks of the dormers to be slated in the same way. All the roofs are to have courses of cut green slate of approved quarry. The portions of the walls of the house, where indicated, are to be covered with best quality of red slate, cut to ornamental pattern and relieved by courses of different colored slates. All the slate work must be guaranteed in writing, for a period of five years, against all accidents or repairs except fire.

Felt.

The entire exterior of the house above the stone foundations, and including all the roofs, is to be lined or covered with Martin's A 1 asphalt, put on smooth and well nailed and secured.

Carpenter's Work.

All the material for the framing of the house, except the intermediates, which are to be the same as the partition material (of 3 x 4 inch best white and seasoned hemlock placed 16 inches from centers), is to be the very best quality of seasoned white pine, as is also all material used in the exterior finish of the roofs and cornices (the scantling used for the joist or rafters is to be of the very best quality of seasoned Virginia yellow pine) and of the following dimensions: sill, 6 x 8 inches, corner posts, or principals at angles of partitions, 4 x 6 inches, at openings, 4 x 4 inches, plates and braces, 4 x 6 inches, 4 x 4 inches and 4 x 3 inches, well braced and bridged. The sills and plates are to run through under the leading partitions, which are to be framed up the same as the exterior walls and in connection with them. All the work is to be properly framed, mortised, tenoned and bolted in the most thorough and workmanlike manner, with wrought anchors, bolts or ties where required. The joists throughout are to be 3 x 10 inches, placed 16 inches from centers. All the joists are to be properly dressed and framed, with double trimmers for all openings and under all partitions running in the same direction, with a row of five 4 x 3-inch herring-bone bridging for each 8 feet of span. All the floors are to be thoroughly counterceiled. (For framing of joist, rafters, or other work around flues, see "Brickwork.") The porch floors are to be supported by 3 x 8-inch double trimmers, set with given fall from building to the post piers; spike to the sides of each 2 x 4-inch strips, for the support of 3 x 6-inch joist, placed not over 2 feet from centers and bridged the same as the floors. The porch floors are to be laid with 6-4 inch clear and thoroughly seasoned white pine, of even widths, 3 inch, tongued, grooved and evenly milled, beaded, secret nailed to each and every joist, smoothed on completion, and painted four coats of best lead and oil, of such color as directed. The floors at the outer face are to be finished with a 4-4 x 9 inch facia, and a 6-4 x 2 inch molding. The various roofs are to be constructed as shown, the principal hips or valleys are to be 4 x 8 inch, the rafters 3 x 6 inch. They are to be spaced as indicated by the drawings, but in no case over 24 inches from centers; all are to have collar beams

securely fixed. Where the collar beams form the loft or tank floor they are to be 2 x 8 inch, doubled, with blocks fastened between; for the balance, 2 x 6 inch, single. The ends of the rafters must be clear of all knots or sap, dressed and cut to the forms designed. The roofs must be thoroughly braced and bridged and framed throughout, sheathed with well-seasoned and thicknessed 4-4 inch white pine cullings, free from all knots, dressed, tongued and grooved. They are to be narrow where they form the overhanging eaves. All the wood used for the exterior finish of the roofs, moldings, brackets, trusses, plates, struts, &c., is to be of prime and clear and seasoned white pine; all constructed to the various shapes and sizes as called for herein or shown upon the drawings, and put up with beaded joints in the most substantial manner. The front bay-window gable to have an ornamental sawed barge 4-4 inch thick, double; this gable will be brought forward so as to cover the balcony over the bay window. The floor of the balcony will be supported at the ends by ornamental sawed and carved brackets, 3 inches on the face. The outer edge of the floor will be covered with a 4-4 x 6 inch sawed facia piece and a 4-4 x 2 inch molding. All the first story windows and the second, where shown, are to have projecting hoods, slated, the same as sides of house. The sides are to be inclosed with an ornamental sawed panel. Construct the balconies where so shown with brackets, 3 inches on face, rails and balusters; the former, 8-4 x 3 inches, molded; the latter, 2 inches square, set diagonally. All the small gables, where so shown, are to be constructed with sawed panel fillings and louvre boarding behind. Place under all window-sills of second and attic stories, except where there are balconies, 4-4 inch ornamental sawed brackets. The porch pedimeuts to be filled with 4-4 inch double, sawed, panel fillings, as designed. The various dormers are to be constructed as indicated; the sides framed up of 3 x 4 inch stuff, spaced 16 and 24 inches from centers; plates, 3 x 4 inches; rafters and collar beams, 2 x 6 inches. The top and sides of the dormers are to be sheathed the same as the roof, also slated. The pediments of the dormers to be filled in with bold carving in relief. Construct the various string courses where and as shown. The roofs of the porches are to be constructed of cypress, prime, clear aud seasoned; hip or valley rafters, 3 x 8 inches; balance, 2 x 6 inches, spaced as indicated, chamfered and have their ends sawed. The sheathing of the same to be 5-4 inch thick, tongued, grooved and beaded. The posts are to be of prime, clear and seasoned white pine, 8 inches square, part turned and molded. The plates of white pine, 4 x 6 and 6 x 8 inches, dressed and chamfered. The rails and baluster same as already specified for balconies. The brackets are to be ornamental, sawed and carved, 4 inches on face, of the same material. The spaces between the porch pins to be filled in with an ornamental lattice-work. The newels of the steps to be 4 inches square, with rails and baluster as above.

Weather-Boarding.

The weather-boarding throughout to be of the very best and seasoned 4-4 inch white pine, of narrow and regular widths, and selected pattern. At all angles and openings it is to butt proper grounds. All the angles are to have 4-4 x 4 and 4-4 x 5 inch angle strips, placed and finished as directed. The orifices left by the weather-boarding to be carefully plugged. All openings are to have 5-4 x 4 and 5 inch casings at sides, 10-4 inch beveled casings at top, all of best white pine, the latter tinned at the top as specified. The weather-boarding on the porches is to finish on a base-board, as shown; for balance it is to be covered with a string, as shown.

Gratings.

The cellar windows to have an ornamental grating as designed, of iron, as also the transom of the front entrance door.

Door and Window Frames.

The door and window frames and doors and sash throughout are all to be made to the various shapes and sizes indicated. The principal rooms of the first floor, the hall and stairway, the second story hall and the toilet room of the first floor will be finished in ash of the best quality, clear, seasoned and bright, of good color and grain. In the hard wood is included the sash, sash beads, pulley stiles and subsill of the portions referred to. The cellar window frames are to be 6-4 inch nosed, with bead planted on to form rabbet. 8-4 inch two-fold sash hinged with best parliament butt hinges, and secured with substantial bolts. They, as also all the other work under this heading, unless specially otherwise specified, are to be of the best quality of seasoned white pine. All the balance of the window frames to be made double boxing. The pulley stiles are to be 6-4 inch, provided with 2-inch diameter standard noiseless pulleys. The window-sills are to be of perfectly clear and seasoned white pine 4 x 6 inches, the sash is to be made as designed, 8-4 inch thick, with molded division or impost for stained glass sash where shown. All the sashes are to be hung with No. 8 Silver Lake drab cotton cord, properly balanced with metal weights; and those of the first story and the second over the porches to have sash locks No. 55. All the windows of the first story are to have outside shutters 8-4 inch thick. They are to have half their hight solid panel and molded, the upper half with heavy pivot slat. They are to be hung with best and suitable slip butt hinges. and secured with Harbuster's fastenings and turnbuckles and substantial wrought bolts. All the door jambs are to be 6-4 inch thick, double rabbeted; where so shown or designated, they are to have molded impost and transom sash, sash same thickness as doors, the same to be made in two folds and hung, where of hardwood, with No. 53 balance best slip butt hinges; all are to be secured with fastenings No. 690. All the doors for the part finished in hardwood are to be veneered in 6-4 inch white pine. Those for the second-story hall on one side only on 8-4 inch. The veneers are to be 5-16 inch thick. All the doors are to be flush molded, paneled and raised paneled on both sides, and sliding doors are to have extra 5-8 molded stiles and rails. All the doors, when not veneered, are to be, for the first story, 8-4 inch; for the second and attic, 6-4 inch; where so shown or desired, they are to be constructed with molded impost and transom sash. The sliding doors are to have bronze dowel-jointed rails No. 21½, Collins' anti-friction sheaves No. 1½, 6 inches, astragal locks and flush escutcheons Nos. 380 and 523; the strike and strike plate of all bronze locks are to be made of uniform design. All the hardwood doors are to be hung with hinges No. 49, locks Nos. 279 and 284, knobs No. 902. escutcheons and roses combined Nos. 2179 and 2179½. All two-fold doors are to have bolts No. 603. Place, as directed, in toilet and bathroom, hooks No. 790. The balance of the doors are to be hung with best slip-butt hinges, and secured with Yale locks No. 1400 for exterior, No. 1500 for inside, the furniture to be white porcelain knobs and roses, extra plated shanks and plated escutcheous. Provide all closets with approved first quality locks. The doors to the vegetable and store rooms of cellar to be substantial batten doors, with approved Yale spring locks. The various doors and drawers of the pantries to be also provided with good and approved locks.

Floors.

All the floors of the first story, except pantries and kitchen, and the second-story hall, to be laid with the very best quality 4-4 inch tongued and grooved ash, eveuly milled, and in no piece exceeding 2½ inches in width. All to have ornamental borders of walnut and maple, of select patterns. All the balance are to be laid with very best Georgia heart yellow pine, free from surface grain, knots, sap, or other defects, tongued, grooved and evenly milled, and no piece over three inches wide. All the floors are to be secret nailed to each and every joist, the ends, at joints, with suitable finishing nails, and the joints shot, and the floors planed smooth and even on completion All the hardwood work must be done after the plastering is done, and immediately filled with two coats of an approved filler and finished with two coats of "Eureka" floor varnish. The yellow piue work is to be finished with two coats of prepared oil. Floor the loft or tank floor with well-seasoned and dressed 4-4 inch cullings; under the tub form a raised floor with 2-inch curb and suitable fall to waste. The floor for the bath is to be sunk and lined for the plumber.

Partitions.

The various partitions are to be constructed where and as shown with 3 x 3 inch and 2 x 3 inch well-seasoned white hemlock studs of best quality; they are to have top and bottom plates, are to be placed 16 inches from centers, thoroughly braced and bridged. The posts forming the pockets for the sliding doors are to be properly dressed, stripped and lined with 4-4 inch seasoned, grooved and tongued yellow pine.

Wainscot.

The kitchen, laundry and bathroom are to have their sides wainscoted 4 feet high, of yellow pine, Georgia heart, tongued, grooved and beaded. The toilet room is to be wainscoted 4 feet, of seasoned ash, same as floor, tongued, grooved and beaded, 2½ or 3 inches wide. The entire linen closet of the second story to be lined with best quality of seasoned cedar, finished as above. The above wainscoting is to be cut in a 4-4 x 2 inch white pine ground and the floor; after the plastering is finished the grounds are to be covered with a 4-4 x 3 inch molding of same material as wainscot; at floor finished with a 4-4 x ⅝ inch floor strip. The vestibule is to have its sides and ceiling wainscoted in ash and paneled. The arch over first-story stairs to have ornamental corbels, rails and turned balusters of ash; same also for the alcove on second floor.

Casings.

The various openings throughout the interior are to have casings or architraves, sills and aprons. They are in all cases to be made of the same material as the finish of the room to which they belong. They are all to be 4-4 x 4 inches, with turned angle blocks. Skirtings or mop boards, 4-4 x 6 inches, as above; all skirtings throughout must be finished with a 4-4 x ⅝ inch molded floor strip. Plinth blocks are to be provided where required. Proper white pine grounds are to be put up for all the above work. Turned hardwood door stops and carpet sills to be put up wherever required.

Stairs.

All the steps or stairs are to have 3 x 12 inches Georgia heart carriages, spaced for former 24 inches; for latter, 16 inches from centers. The exterior strings and risers are to be made 4-4 inch; the treads, 8-4 inch, nosed prime and seasoned white pine. The rear and main stair from second story up to have 4-4 inch risers and 5-4 inch treads of prime, clear and seasoned Georgia heart. The main stair from first to second floor is to have 4-4 inch risers and 5-4 inch treads of ash, with nosing and scotia and inclosed string of same material. The rail to be double-molded 2¼ x 4 inches ash and 2¼ x 3½ inches mahogany. The newel and balusters are to be of ash, both turned and molded. The main stair is also to have an ornamental carved filling, as designed, between balusters, the same to be of ash. The newel is to be 9 inches diameter; the balusters 2 inches on the square.

Mantels.

Put up neat mantel shelves in kitchen, laundry and rooms for which there are no mantels. Provide and set various hardwood mantels and others, as designed, the mantels to correspond with the finish of the various rooms.

Closets, &c.

Fit and fix up the various closets throughout the house as desired, with shelves, hook racks, hooks, drawers, &c., complete. Place also hook racks and hooks in the bath and toilet rooms. Put up also shelves as desired in the store and vegetable rooms. Place a dresser in the kitchen and laundry, with drawers, doors and 6-4 inch glazed sash, the doors to be 6-4 inch paneled, the drawer and sink stands of the kitchen and pantry to be made of yellow pine heart. The pantries to be fitted up with cases with 6-4 inch

paneled doors and glazed sash, fly wire where desired ; where directed, lower part to be arranged for barrels, with lifting tops. The various doors and sash to be hung with suitable size hinges, and the drawers, doors and sash of the pantries provided with good locks, knobs, pulls and fastenings. The carpenter must do all woodwork in connection with the plumbing with substantial and seasoned material. All the above work, with exceptions as stated, is to be of white pine. The water-closet, wash-stand and bath-tub casings are all to be of the best seasoned ash. The water-closet to have double-hinged brass flaps, movable panel face, as is also the bath-tub casing, to be put up as directed with screws, so as to be readily taken apart. The linen closet to be fitted up with cedar drawers and shelves.

Hardware.

All the hardware used throughout is to be of the very best quality, of approved size, pattern and manufacture. All such as is specified by "Nos.," except the Yale, is to be real bronze of the "Hopkins & Dickinson" manufacture ; in connection with such provide for first floor sash pulls No. 1084½ ; lifts, 801, and for balance lifts, 806.

Heating.

All the hot-air pipes are to be made of the best quality of X bright charcoal tin, the same to be well stayed and braced at every joint and all to have proper collars. All circular pipes are to be 8 inches diameter ; square, 4 x 8 inches. All the flues in partitions or passing under floors are to have an outer casing of best No. 24 galvanized iron, well braced and filled, the casing to be 1 inch larger than the inclosed pipe, with plaster of Paris. The smoke flue to be 8 inches cast iron, well stayed and braced at every joint. Place black enameled slat registers of required size to all flues. See below for furnace.

Bells.

August Hahl's electric bells, with annunciator, gongs and batteries complete, of the very best character, to be run into one chamber of the second floor, the bathroom, halls and dining-room to the kitchen ; also from front and vestibule door ; also from designated chamber to the servants' room Put up, also, speaking tubes from the designated chamber, the bath and laundry to the kitchen, as directed, with nickel mouth-pieces of approved pattern. The pulls to the entrance door to be real bronze, No. 751 ; knob, No. 902.

Gas Fitting.

Gas pipes of the best wrought iron, and of sizes in accordance with the New York Gas Company's rules and regulations, except that, in all cases, they shall be one size larger, shall be run in red lead throughout the entire house, with outlets wherever desired, the same to be left capped on completion of the work. The work to be done in the very best manner, free from all traps, and satisfactorily proven, tested and passed.

Plumbing.

Provide and place in loft, on proper scantling, a tub of 1000 gallons capacity, made of the best clear and seasoned white pine, with leaded joints, and substantially and satisfactorily hooped. Provide and set complete, with all the connections, in the kitchen, a suitable kitchen stove or range. Line under all wash hand basins, water-closets, bath-tubs and the tub neatly with 4-pound lead, milled and connected with waste. "Adee" traps are to be provided directly under the bath and basin fixtures. Provide 1½-inch countersunk molded and polished white Italian slabs for all wash hand basins, with 12-inch ditto bracketed backs, of approved manufacture. The basins to be Mott's 14-inch decorated bowls, with patent overflow. They are to have rubber plugs and heavy plated chains and chain holders. The wash-trays are to be of the Morahan Ceramic Company's manufacture, on galvanized-iron stands, with 8-4 inch framed yellow-pine tops, hinged. The boiler to be of heavy galvanized iron, of 60 gallons capacity, complete, with all connections with stop, finished in waste and same connected with kitchen waste. The sinks are to be of heavy cast and galvanized iron. The bath-tub is to be 18-ounce planished and heavily-tinned copper. A small "Bedfordshire" urinal to be placed in the toilet room, with a Doherty patent plated faucet. The water-closet is to be of the H. C. Meyer & Co.'s Brighton closet, with reservoir, complete in every respect. The vertical soil pipe is to be 4-inch cast iron, calked in lead, and to pass directly out through the roof and be finished as directed. The horizontal pipes are to be 6-inch cast iron, and to be connected to the drain with running traps. The drains are to be 8 inches in diameter, cement pipe, laid with proper fall to cesspool. Both cesspools are to be connected with a drain same as that from house. The cesspools are to be covered with suitable-sized flags, 3 feet below the surface of the ground. The urinal to have a heavy 2-inch lead waste, trapped as above, and connected with the soil pipe. The various wastes are to be of ½-inch cast iron calked in lead, and also to pass out through the roof as directed and connected with the drains ; when requiring it, they are to have extra heavy lead connections to the fixtures. All the various supply pipes are to have, besides the main stop and waste, stops and wastes in each branch, also over kitchen boiler, so that any part of the work can be shut off without interfering with any other. They are to be tagged with metal tags and numbered on completion. All the various fixtures are to be extra plated and guaranteed by the maker. All are to be of the H. C. Meyer & Co. manufacture and of the Fuller patent. For the cellar, place where directed a ¾-inch hose bib ; for kitchen sink and wash trays, ⅝-inch. Pantry cocks, No. 2 : basin cocks, No. 4 ; bath combination, No. 2, with rubber tube and sprinkle shower. The tub is to have a 1½-inch standing waste communicating with the floor, and there connected with a 2-inch galvanized iron waste which is to enter the bath waste. The supply to the tub is to be 1¼ inches ; all connections with the tub to be made with brass couplings, with flange and locknut. Place a stop-cock in the supply from the tub where it leaves the same. Extend the hot-water supply pipe over the tub to form a drip. All the above pipes, as also all the balance forming the supplies, are to be of the best quality of wrought and galvanized iron, put up in red lead with galvanized steam fittings and brass unions. All pipes are to be put up so as to drain perfectly. Supplies with stop for hose attachment are to be run in two sides, to exterior of walls where directed. There are to be hot and cold water supplies to all fixtures of the house except water-closet and urinal. The pipes running from the tub are to be 1, ¾, ⅝, and ½ inch, with extra heavy lead connections where directed. The kitchen boiler to be placed on an approved stand, cast iron. All the brass work to be done, as also all other work, in the very best manner. The plumber is to make all connections between the well and the tank as required. The owner will furnish the pump, as also the gas machine.

Plastering.

All the walls and ceilings, inclusive of the ceiling, excepting those of the cellar and lofts, are to be lathed with prime, well-seasoned white-pine laths, the joints well broken and to give a good key. All the above work is to be finished with two coats brown mortar and for the entire first story, hall of second ; also ceilings of second to receive a fine sand float. The cellar ceiling is to be finished smooth in two coats ; all the balance, including the laundry walls and ceiling, are to be finished white coat or hard finish. All the rooms of first story, excepting kitchen and pantries, all the rooms of the second and billiard room of the third, are to have molded cornices of an average girt of 20 inches. All the above specified portions to have center pieces selected by the architect. All the above work is to be done in the very best manner, true, plumb, out of wind, with sharp or molded arrises, free from blisters, chips, cracks and all other defects. The mortar to be composed of the best, well burnt fresh lime, to be thoroughly slaked through two boxes, calcined plasters, clean sharp sand, and fresh, well cured winter hair, mixed in proper portions.

Glass.

All the glass above the cellar is to be of the best quality of double thick "French," the balance to be of the first quality N. Y. glass. All is to be well bradded, bedded, puttied and left perfect on completion of the work. All the stained glass is to be glazed over on outside with "French," quality as above.

Paint.

(See also roofs and floors.)

All the hardwood work throughout the house, unless otherwise specified, is to be filled with an approved filler, and properly rubbed down, after which it is to finished with an approved hard oil or shellac to a uniform and smooth polish. All the wainscot or yellow-pine work is to receive two coats of furniture oil and two coats of hard oil, as directed. All the work in the exterior usually painted, if of metal is to receive two coats, if of wood or brick three coats, in addition to the priming, of the very best white lead, and oil of such color, shade or as many such colors or shades as may be required by the architect, all the chamfers and ornamental work being picked out in color. All the prominent portions of the iron work, as also the lead bars of stained-glass windows, to be gilt, with heavy and best gold as directed. The work to be thoroughly prepared, puttied, rubbed down and sand-papered. The colors to have a good body, and to be well and evenly laid on, and the whole finished in the very best manner.

Furnace.

The hot-air furnace to be the largest size portable from Alva Hubbard.

Generally.

All the above work is to be done in the very best and most workmanlike manner, using only the best of materials as herein specified. The architect is to have full and entire control of the work, and may at any time reject any work done or material furnished if the same be not in strict accord with the drawing and this specification. The drawings are to be taken as part of this specification.

Finally.

The contractor agrees to furnish all the necessary scaffolding, tools or other appurtenances required in the proper prosecution of the above work. He will be held responsible for all accidents or losses until the full and final completion of the work, and its acceptance by the architect.

Witness,

.... { .... (L. S.)
{ .... (L. S.)

Agreement.

Articles of agreement made on this the day of A. D. by and between builder of , of the first part and of , of the second part, witnesseth ; That for and in consideration of the sum of money hereinafter stipulated to be paid to the party of the first part by the party of the second part, the party of the first part has, and by these presents does hereby agree to furnish all labor and material of every kind, and to build and complete on in the premises of the party of the second part, situated in a residence as shown upon the drawings and set forth in the specification prepared by architect. The which drawings and this specification are verified by the signatures of the parties hereto, and are to be taken as a part of this contract. And the said party of the first part agrees that all materials furnished or workmanship employed shall be of the very best character and quality as mentioned in the said specification, and shall be approved of by the said architect, whose decision in all matters affecting the same shall be final and conclusive. He further agrees to save the party of the second part free from all liens which might possibly be enforced on account of materials fur-

nished or workmanship employed, or work done on or about the said premises, and that he will complete, in accordance with the said drawings and specification, and to the full and entire satisfaction of the architect, all the work that is to be done by the 1st day of next ensuing the date hereof. A penalty of $20 to be inforced for each and every day that the work remains unfinished beyond that time. In consideration of which the party of the second part agrees to pay to the party of the first part the sum of $ as follows :

When the foundations are complete and ready for the framing.... $
When the entire building is under roof.....
When the entire building is ready for plastering.....
When the entire woodwork of the house is completed.....
When the entire work is finished.....

And the balance (two-fifths) of $ sixty-one (61) days after such satisfactory completion. All the above sums are to be paid upon the order of the architect and the party of the second part, being satisfied that all liens for materials or labor have been either released, waived or discharged. And it shall not be in the power of the party of first part to claim for any extra work done or material furnished, or alleged to be done or furnished, unless an order in writing signed by the party of the second part or his architect be produced as an authority for such extra work. In witness whereof the parties hereto have affixed their signatures.

Witness,

..... } ..... (L. S.)
..... } ..... (L. S.)

"STAR."

SPECIFICATIONS

Of a frame dwelling house, for Mr. James Smith, Brunswick, N. Y.—Henry Blank, architect.

Note to all Contractors.

The different branches of work below specified are intended to be included in one general contract, with contractor solely responsible for, and to, all other mechanics Should it be hereafter decided to sublet any branch of work, the sub-contractor shall be held to general conditions, and other parts of specifications, only so far as his men and work are concerned.

Contractors will inclose signed proposals, in sealed envelopes, directed to Owner, care of Architect, with bid for work in full; and if any part of work is omitted, to be clearly stated. All proposals will be closed Saturday, August 26, 1882, at 12 m.

General Index.

	Pages		Pages
General Conditions.....	176	Gas Piping.....	180
Masonry.....	176	Bells and Tubes.....	180
Carpentry.....	178	Furnace Work.....	180
Iron Work.....	180	Plumbing.....	180
Lath and Plastering.....	180	Painting and Glazing.....	181

A specification of materials to be provided, and of work to be performed, in the building and completion of a frame dwelling house, for James Smith, on land owned by him, situated on the southeast corner of Main and South streets, in the town of Brunswick, N. Y., in accordance with drawings prepared for the purpose by Henry Blank, architect, under his superintendence, and to his satisfaction and acceptance.

General Description.

Position of House The building to be erected has a frontage of about 40 feet on Main street, and a depth of about 46 feet on South street; the southeast corner of house being distant 60 feet from Main street, and 20 feet from South street. The house is of wood, two stories finished, with attic and cellar partly unfinished.

Hight of Stories. Cellar, 7 feet 6 inches high in clear. First story, 10 feet; second story, 9 feet; attic, 8 feet. The cellar walls are of ledge stone, the underpinning and chimneys of brick, the

Exterior Finish. walls of first story clapboarded, second story covered with cut shingles; roofs shingled. Interior finish of library, din-

Interior Finish. ing-room, hall, parlor and bathroom, of ash; all other rooms and closets of pine, shellaced, except kitchen, laundry, back halls and stairs, toilet-room and pantries, which will be pine, varnished. The lot is 75 x 250 feet, practically level, cov-

State of Lot. ered with loam to a depth of about 18 inches, and apparently free from large stones or ledges. The railroad station

Access to Lot. is distant one-half mile, by a level and graded road. A stone quarry is one-quarter mile from house, on same street.

Gas and Water Supply. Gas will be used, the company bringing pipes to inside of cellar wall. Water and drainage system must be provided by contractor.

General Conditions.

Time Allowed The contractor will commence work on building, September 1, 1882, and will entirely finish and deliver said building to owner, on or before March 31, 1883. Forfeiture as agreed upon in contract.

Payments. Payments shall be made to contractor as agreed upon in contract, but in no case shall they exceed 70 per cent. of value of work completed to date of payment, the final payment being due 30 days after written acceptance by architect. Nor shall any payment be made by owner, unless upon written certificate from architect, who shall have good evidence that the work required is completed, and that the estate is free from all claims chargeable to the contractor. And if,

Liens. at any time, any lien or claim is established, for which the owner may be made liable, and which would be chargeable to contractor, the owner may retain from any payment due, or to become due, an amount sufficient to indemnify himself against such lien or claim, until the same is canceled.

Work and Materials—Foreman The contractor, or a suitable foreman, is to give his entire time and superintendence to the work, to furnish all needed apparatus, material and labor for completing the entire work in the manner required; all labor to be performed by skilled mechanics in a thorough manner; all materials to be of the quality demanded, and where not otherwise specially described, of the best quality.

Working Drawings. The contractor will be furnished with all necessary drawings and directions for the prosecution of the works. Drawings and specifications are to be kept constantly at the building, and frequently referred to; following drawings accurately according to scale, large details to be preferred to small ones, and figures in all cases to take precedence to measurements.

Discrepancies. Should there be any discrepancies, or should any question arise as to the true meaning of any particular in said drawings, specification or contract, reference shall be had to the

Architect's decision. architect, whose decision thereon, and in all questions in connection therewith, shall be final and binding on both contractor and owner. The contractor will not use, or permit others to use, any portions of drawings or specifictions for any other purpose than of the building under this con-

Drawings how used and to whom returned tract. Said drawings and specifications are the property of the architect. They are to be carefully used, protected from wet and injury, and returned to said architect before the final payment is made, and the contractor will be held pecuniarily responsible for loss or injury to drawings or specifications while in his possession.

Changes Should the owner at any time during progress of work request any change, addition or omisson, he shall be at liberty to do so, without affecting or making void the contract, but the cost of such change shall be added to or deducted from the contract by a written agreement. If the contrac-

Non-fulfillment of Contract. tor at any time during progress of work fails to supply a sufficiency of materials or workmen, the owner may, after giving contractor three days' written notice, finish said work, and the cost shall be deducted from any amount on contract then or thereafter due contractor.

Insurance. The building is to be kept insured from fire from date of framing first floor until written acceptance of building by architect. Insurance to be in such a company and of such a sum as shall be satisfactory to architect. The amount to be made payable to owner, and cost of insurance to be paid by contractor.

Heating The contractor will provide all necessary apparatus, fuel and attendance for thoroughly heating the house during cold weather. He shall not use the furnace, plumbing,

Tobacco range or fire-place for any purpose whatever. Tobacco, in any form, is prohibited in building after plastering is finished; also any heating apparatus that will blacken or otherwise discolor plastering.

Sidewalks free from Obstructions. The sidewalks and street of Main street must at all times be kept free from obstruction, but the sidewalk and roadway on South street for a width of 15 feet and a length of 60 feet may be used for unloading and storage. Any obstruction of street or sidewalk shall be protected by stout barricades, whitewashed and hung with red signal lanterns every night until removed.

Town Rules. All town rules and fees are to be complied with and paid by contractor.

Protecting work The contractor shall wrap, cover or protect all work liable to damage from plaster, bruising, weather, &c., and will hold the owner harmless from any accident that may occur on the works.

Architect's Visits. The architect, or person appointed by him, shall at all times have free access to works, and shall be provided with all necessary facilities for inspecting the same, and he may require the contractor to prevent the admission of any person not employed on the works, unless provided with a permit from owner.

Masonry.

Staking Out. The contractor will stake out the position of building as indicated by architect, with all necessary batter boards, correctly marked with face of studding, underpinning and footings. Take care to secure correct lengths, widths and true angles.

Temporary Privy. Before proceeding with excavating, the contractor will build, where directed on lot, a neat temporary privy for workmen's use. Keep in good condition, abate any nuisance and remove building and contents when directed by architect.

Removing Top Soil. Remove from building site, and for 15 feet all round it, and from foot paths to front and rear doors, all sods and loam, carefully cutting and stacking sods, and piling the loam on lot where directed by architect.

Excavating. Do all necessary excavating for walks, drains, cesspools, and cistern, for trenches to walls, piers, chimneys, and foundations to piazzas, for cellar and cellar walls, and for all other works mentioned or shown which require it. All excavations to be to the full depths, lengths and breadths

Depths of Excavations. required by the drawings, or herein specified, and excavations for pipes and foundations, in all cases to be carried below the reach of frost.

Blasting & Pumping. Do all blasting of rock, and pumping and bailing of water found necessary for the proper execution of work.

Depth of Cellar. The cellar is to extend under the whole house; to be 7 feet 6 inches deep from ceiling to concrete, with bottom of footings 18 inches below concrete.

Position of First Floor & Grades. The top of first floor is 6 feet above and concrete level 32 inches below natural level at southeast corner, at which point the finish grade is 18 inches above natural grade, with brick underpinnings 3 feet 6 inches high to bottom of sills.

Bottom of Footings. Footing trenches to be filled for a depth of 10 inches with loose cobble stones, well rammed and leveled off for footing courses.

Size of Footings Footings to be of large flat stones, at least 2 feet 6 inches wide and 10 inches deep, well bedded and laid in half cement mortar.

Cellar Walls. Build all exterior cellar walls, above footings, to hights required; to be 2 feet thick at bottom, with a gradual batter on outside to 18 inches thick at top. To be of sound ledge or pasture stone, square corners; no round boulders; all laid with natural beds and builds, smooth faced on both sides, built up solid, level, true and plumb, using slate pinners for joints, well wedged.

Mortar. All the above walls are to be laid with mortar of best Rockland lime, sharp sand and one-third best Newark cement, well and freshly mixed. All walls to be well bedded in the above, and outside walls of house to be heavily plastered with mortar of two-thirds cement.

Stone, Sills Steps, &c Provide and set all necessary window-sills in basement of planed North River stone, 3 courses high, 1½ x 4-inch wash, 3inch-lugs; also plain, axed North River stone steps, platforms, threshold and wall capping, to side basement steps. Platform rebated, and provided with 12 x 12 inch iron grating, with dry stone well under. All the above steps and platform to be built on suitable rubble foundations, and laid in clear cement. Provide and set, on suitable rubble foundations, a plinth of hammered Monson granite, 10 inches wide by 15 inches deep, in lengths of not less than 6 feet, to extend along line of lot on Main and South streets, and on either side of walk from Main street to front steps. Include four blocks for front and side entrances; to be 12 x 12 x 20 inches, with pyramid tops, hammered. Fill in with clean gravel, free from refuse and large stones, and ram solid around all walls and footings as soon as mortar or cement of walls is dry. Cellar bottom to be leveled, puddled, rammed and left clean and ready for concreting. Surface of ground under piazzas to be refilled with clean gravel to grade.

Step Foundations.

Side-walk Plinth.

Filling trenches &c.

Under-pinning. Walls of underpinning to be of brickwork, 12 inches thick, laid up solid and plumb to line of sills, and bed sills in mortar; leave all necessary openings for doors and windows; walls of basement and steps to be of brick, 12 inches thick. Build, above suitable rubble footings, all necessary piazza piers, 12 x 20 inches, of hight required by elevations; laid up perfectly solid and plumb.

Piazza Piers.

Interior Brick Walls. Build, on suitable footings, to underside of floor beams, all necessary cross and partition walls of brick, 8 inches thick. Form all openings of widths shown, 6 feet 8 inches high, with flat arched tops.

Chimneys. Build, upon solid foundations, four chimney stacks, where shown, with flues and fire-places as indicated; to be built up perfectly solid and true, with flues 8 x 8 inches, plastered smoothly on inside from top to bottom, and on outside from bottom to roof line. Rough fire-places to be 3 feet wide, 3 feet 6 inches high, 1 foot deep, with 8-inch brick backs. Build in suitable iron mantel bars over all fire-place openings. Parlor, library and dining-room fire-places to have ash-pits, with suitable iron doors and frames, at cellar floor. Turn brick trimmer arches in front of all fire-place openings, to average 18 inches in width and 4 feet 6 inches in length; level up to receive tiling.

Fire-Places.

Ash-Pits

Trimmer Arches.

Terra Cotta. Top out chimneys as shown on elevations; provide and set terra cotta panel on south side, and terra cotta caps at top of all chimneys. Build on northwest corner of house,

Water Cistern 10 feet from wall, a circular brick cistern, 8 feet in diameter, 10 feet deep, with domed top. Brickwork of cistern to be 8 inches in thickness, plastered with Newark cement on outside, and smoothly grouted with same on interior.

Filtering Box. Build soft brick filtering-box at bottom, filled with bone charcoal; leave all necessary openings for supply and delivery pipes, and make all needed water-tight connections when desired. At top of cistern construct suitable manhole

Cistern Cover. 2 feet square, inside, with planed North River stone cap, 2 feet above finish grade; stone rebated, and fitted with weighted cast-iron cover and ring.

Quality of Brick. All the above mentioned brickwork to be hard burned, square-edged, true, first quality, common Haverstraw, or its equal, approved by architect; no soft, jobbing, or chimney brick to be used in any part of the works. Cistern to be of the hardest burned sewer brick. Exposed walk in underpinning, area, piazza piers, and chimneys, to be of selected common brick, culled for shape and color.

Laying Bricks. All brick to be protected from weather, to be well wet during summer months, before using, and laid dry in winter, but no brick laid during freezing weather. Protect all

Protection. fresh laid brickwork from rain or frost. All brickwork to be laid up solid, true, and plumb, in mortar, as below specified, with close, solid joints, bonded every sixth course in

Bond. hight, with blind headers for exposed work, and through headers elsewhere. Chimneys to be at least 1 inch clear of any woodwork, and flues to be kept free from any obstructions. Joints of common brickwork to be flush; where exposed, to be pointed.

Mortar of brieks All brickwork to be laid in mortar, composed of three parts best Rockland lime, one part Newark cement, and six parts clean, sharp, pit sand, free from loam and salt; all well mixed before using. Mortar in all exposed bri. kwork to be colored red, by addition of sufficient Venetian red.

Colored Mortar.

Drain & Water Pipes. Cistern to be laid and plastered with clear cement. To provide and lay, outside of house walls, all necessary water and drain pipes, as follows: from main soil pipe to cesspool, a distance of 75 feet from rear of house; from laundry tubs to catch basin; from catch basin to overflow; from cistern to overflow; and from rear corners, at junction with water conductors, to cistern and to cesspools.

Material of Pipes. All drains to be of best Akron, vitrified, earthenware pipe, all connections made with suitable Y's, elbows and bends; no T's to be used.

Laying Pipes. Drains to cesspool to be 6 inches internal diameter, from laundry 3 inches, from overflows and from conductors to cesspools and cisterns 4 inches. All to be laid in cement, on solid foundations, hollowed for hubs, below action of frost, with a regular fall of ¾-inch to every foot in length, and properly entered into cistern, cesspools, &c. Make all joints and connections air-tight, and remove from interior

Filling trenches Traps & Connection of Pipes. of pipes all superfluous cement. Trenches to be carefully filled, only after architect has examined and approved the work. Drains at connection of sewer and cistern pipes with conductors, to have suitable, accessible valves, in order to send water to cistern or cesspools, as desired. Drains to catch-basin to have S traps, with movable cover, and vent in bend of S. Drain to cesspool to have a similar trap, below junction of conductor drain. Cistern and catch-basin

Over-flow Pipes. to have overflow pipes, near surface, terminating in well of dry stone, at least 6 feet from outlet.

Catch Basin. Build, where shown, a circular catch-basin, 3 feet 6 inches inside diameter, 6 feet deep, (4 feet below inlet,) brick wall, 8 inches thick, in cement, covered with North River stone, rebated, and fitted with heavy, weighted iron grating.

Stone Cesspool Build at a distance of 75 feet west of rear wall of house, a circular leaching cesspool, 6 feet in diameter, 8 feet deep (6 feet deep below inlet), of fieldstone, laid dry, with brick domed top in cement. Covered with planed, North River stone, 2 inches above grade, rebated, and fitted with heavy, weighted

Cellar concrete iron grating. The entire bottom of cellar to be covered, when directed, with a heavy layer of concrete, 3 inches thick, mixed in proportion of one barrel Newark cement to four barrels clean, sharp and coarse gravel. Upper surface to be floated with English Portland cement, troweled

Making Side-walks. smooth and clean. Over sidewalks on Main and South streets put a layer of cobble tones, and over this a layer of coarse gravel, to hight of 6 inches above present sidewalk, with slight pitch to street; finished surface of fine screened gravel, puddled and rolled. Sidewalks on Main street, 8 feet wide; on South street, 6 feet wide; no gutters or curbstones included.

Yard Walks. Over trenches for walk from Main street to front piazza, and from South street to kitchen entrance, fill with loose cobble stones, and above this, to grade, with gravel, as specified for sidewalks. Walks to be 5 feet wide. The grounds on

Loam filling. front, sides, and for 20 feet from rear of house, to be filled to a depth of at least 15 inches, with good, clean loam, free from refuse, and weeds. Carefully grade off on all sides, with

Sodding and grassing uniform pitch from walls to sidewalks. Sodding to be placed along walls of house. The grounds to be well rolled, wet, and sown with best quality of lawn grass seed. After build-

Finish Fire-places, &c. ing is plastered, lay hearths, and build finish fire-places as follows: parlor, library, and dining room to have hearths 1.6 x 4.6, of plain, glazed, 4 x 4 inches olive, Low's tiles, with border of 2 x 6 inches, glazed, blue tiles, daisy pattern.

Hearths For chambers, hearths to be 1.3 x 4.0, of 6 x 6 inches, plain, unglazed red American tiles, with 3 x 6-inch tile border of same. All tile hearths to extend to back of fire-places, carefully cut, and fitted to jambs, ash grates, &c. Fire-places

Fire-Places. in library and library chamber to have facings of 6 x 6 inches, glazed English tiles, in ornamental patterns, worth 35 cents each, set with polished brass rim; top, side and back pieces, of soapstone, with sliding soapstone damper.

D. Room Fire-Place. Dining-room to have facing of best Peerless Philadelphia brick tiles, 4 x 4 inches, ornamental patterns, with terra-cotta panels, as indicated on mantel details; rebated soapstone jambs, back and top, the latter with sliding damper.

Parlor fireplace Parlor to have facing of polished Sienna marble, 3 inches wide, half-circle top, sides, back, &c., as in dining-room. Library, dining-room, and parlor fire-places to have movable iron ash grates, set in hearths.

Chamber Fire-Places. Dining-room chamber fire-place to have facing of polished, black marble, 5 inches wide, and parlor chamber fire-place to have border piece of polished red marble, 2 x 2 inches, molded. Chamber fire-places to have soapstone sides, &c., as specified for dining-room.

Building Fire-Places. All the above mentioned fire-places to be of sizes to fit wood mantels, all hearths, tiles, &c., to be laid true and level in best Portland cement, cleaned down when directed, and protected by boarding from injury.

Furnace Foundation. Build, under direction of furnace contractor, a suitable brick foundation for portable furnace. Leave openings in walls for passage of drain and water pipes, when directed. In kitchen, laundry, kitchen chamber, and rooms in attic,

Chimney Receivers. build securely into flues, when directed, cast-iron receivers, with soapstone collars around woodwork, and sheet-iron thimbles. Build enameled 8 x 8 inches, movable, ventilating

Vent. registers. registers into flues of three rooms, where directed, and provide with cords, &c, for operating the same. Build suitable,

Cement Weathering. cast-iron collar for furnace smoke-pipe, when directed. Carefully protect all exposed brickwork with oil, cement, and

Anchors &c. zinc. Furnish, and build in, all requisite iron ties, anchors, rods, &c., necessary in construction of brick or stonework.

Cleaning brick work. Whitewashing. Clean down, when required, all exposed brick and stone-work with diluted acid; thoroughly scrub and repaint walls if necessary. Give all brick and stone walls in cellar, where exposed, two heavy coats lime whitewash.

Carpentry.

Framing. Do all necessary framing, as indicated on plans and elevations, with good, second quality, sound, dry pine, of dimensions given below or shown in drawings. To be framed with second story joists resting on girts, and attic joists gained on plates.

Size of Timber. Sills, 6 x 8 inches; first floor joist, 2 x 11 inches; plates on cellar brick walls, 3 x 8 inches; exterior studding 2 x 4 inches; posts, 4 x 8 inches; braces, 3 x 4 inches; piazza sills, 6 x 6 inches; piazza joist, 2 x 6 inches, flush with top of sills, and sills on line with top of house sills; piazza plate, 4 x 9 inches; headers and trimmers to floor joist, 3 x 11 inches and 4 x 11 inches; second-story flush and sunk girts, 4 x 6 inches; joist, 2 x 10 inches; headers and trimmers, 3 x 10 inches and 4 x 10 inches; partition caps, 3 x 4 inches; piazza rafters, 2 x 8 iuches; studs, 2 x 4 inches; attic joist, 2 x 9 inches, halved on plate, with 2 x 8 inch ledges cut in under overhang of plate; headers and trimmers, 3 x 9 inches and 4 x 9 inches; plate, 4 x 9 inches; partition caps, 3 x 4 inches; roof rafters, 2 x 9 inches; hips, 3 x 10 inches; ridge, 2 x 13 inches; studding in gables, 2 x 4 inches; rafter ties, 1 x 8 inches; rafters to be 18 inches on centers; floor joist and exterior studs, 16 inches on centers. All the above framing to be mortised, tenoned, framed, piuned, spiked, strapped, braced and trussed in most thorough manuer. Floor timbers to have full and true bearings, to be well bridged every 10 feet with 1 x 3 inch herring-bone bridging, properly cut in, and nailed with 10d. nails. Posts, studs and rafters to be in one contiuuous piece, without splicing. Floor iu laundry and back hall in cellar to have floor boards resting on 6 x 8 inch locust sleepers, bedded into concrete. Double studs around all door and window openings, trussed over. No woodwork to be placed within 1 inch of auy chimney, nor is any nail, screw, &c., to be driven into chimueys.

Manner of framing. Bridging. Sleepers. Protecting Chimneys.

Floor, Wall & Roof Boards. Cover all outside walls, roofs and floors, joist of first, second and third stories, also sleepers in cellar, with good quality, sound 7/8 inch hemlock, not over 10 inches wide, free from large or loose knots or weakening shakes; square edged, mill-planed on one side, laid with close joints, well nailed, with at least two 10d. nails to each stud, joist or rafter, and not more than three boards cut upon the same stud, joist or rafter together.

Interior Studs. To set all interior studding in accordance with plans, using 2 x 3 inch and 2 x 4 inch sound, straight and square-edged hemlock studding, 16 inches on centers, set perfectly plumb, with feet of studs in one story directly over heads of studs in story below, and well nailed to partition caps. Studding to be doubled at angles and at large openings, trussed over doors, windows, and wherever else necessary, and bridged once in hight of each story with 2 x 4 inch studding, set on angle and well spiked.

Trussed Partitions. Unsnpported partitions to be trussed, when required, in most thorough manner, with 1 x 6 inch hard-pine straining pieces, cut into studs and well nailed to same.

Furring. Do all necessary furring according to diagrams, for arches, beams, pilasters, &c. Fur all ceilings and soffits of stairways throughout the house where plastered with 1 x 3 inch, mill-planed, dry, sound hemlock strips, all set true and level, 16 inches on centers, well nailed to every joist with 10d. nails. Butts of ceiling furring to break joints on joist and to be double nailed. No furring to be nailed on chimneys, but they are to be inclosed by 2 x 3 inch studs, well braced, and set 1 inch clear of brickwork.

Fur on sides of outer studs from sill to plate with 1 x 1 inch strips, for back plastering.

Grounds & beads. Provide and put up, true and strong, 3/4 inch angle beads and grounds on all corners, and for bases, architraves, dadoes, and wherever else required.

Sheathing Paper. All walls and roofs, before clapboarded or shingled, to be covered with one layer heavy, rosin-sized, water-proof sheathing paper, well lapped.

Clapboards. Cover exterior walls, from water table to first story ceiling, with first quality, planed pine clapboards, laid not over 4 1/2 inches to weather, and well nailed to every stud with galvanized clapboard nails.

Wall Shingling. Above clapboarding cover walls to eave finish with first quality, sawed, 16 inch cedar shingles, laid not over 7 inches to weather, with two galvanized nails to each shingle. All to be of uniform width of 6 inches and cut to pattern as indicated.

Roof Shingling. Cover all roofs, including dormers, gables and piazzas, with first quality sawed cedar shingles, 16 inches in length, 6 inches to weather, and not more than 7 or less than 3 inches wide. Carefully break joints and fasten with two nails to each shingle. Side walls of dormers to have cut shingles, elsewhere plain.

Exterior Finish. All exterior finish to be of No. 2, sound, dry, pine plank, as indicated on drawings, or below specified, to be planed, smoothed with clean, sharp moldings and arrises; thick work to be sawed out of solid, if possible, otherwise put together in best manner with white lead and well nailed. Form all belts, water tables, casings, &c., as indicated ou drawings.

Corner Boards, &c. Corner boards and casings to be 1 1/4 x 6 inches, 2-inch corner beads to angles of shingling in second story. Bottom of water table on line with top of piazza floor. All piazzas to

Piazza Floors. be floored with 1 x 6 inch, rift sawed, hard-pine strips, well nailed to joist, laid 1/4 inch open, with regular pitch from wall to piazza edge, which will be rounded, with moldings and screenwork as indicated. Put up all necessary outside steps, posts and rails. To have 2-inch plank carriages 12 inches apart, supported at lower end on 6-inch red cedar posts; 7/8 inch pine risers, 1 inch rift-sawed, hard-pine treads, 1/4 inch open, edge of steps rounded, with molding under, returned on side; and end stringers to be cased and finished, as shown. Finish piazzas with pediment on front, as by details. Posts, 9 x 9 iuches, square and turned; brackets, 4 inches thick; rail, 6 x 6 inches, molded; balustrade, of 2 x 2 inch stock, square and turned, as shown; all framed and securely nailed in place. False rafters, 3 x 9 inches; upper boarding, in overhang, matched and planed; plate cased, and inside of piazzas to be sheathed up rake of roof with 7/8 inch narrow, matched pine, with bed molds at junction with house wall. No gutters to piazzas.

Outside Steps. Piazza Finish.

Window finish &c. Finish around window hoods, mitering belt molding around same; put up all necessary window aprons and caps, carved wood panel on South street side; all brackets, balustrade, gable and dormer finish as indicated.

Main Cornice, Conductors. Form gutter to main house as per details; to be hung on 3 x 9 iuch false rafters, with necessary pitch to west side, and connect with 4-inch galvanized iron conductors through lead goose-uecks. Conductors placed as shown on basement plan, well secured to wall, and properly entered into earthen drain pipe. Finish caves as indicated; roof-boarding in overhang to be matched and planed. Verge boards generally 2 1/2 x 12 inches, paneled as shown. Floor in recess over front bay to be of 1 inch rift, hard pine, calked with oakum and made water-tight; pitch floor to front and form small gutter, connecting with main gutter. Form and put up roof cresting and finials, also put up iron finials (see page 180) and window guards, as specificed in iron work.

Front, recessed balcony floor. Wood Cresting. Flashing. Flash in the best manuer around all dormers, gables, door and window casings, piazzas and other roofs, belts, &c., with best zinc, well fastened and made tight. All valleys to be laid close, with zinc flashings worked under shingles. Hips to be flashed tight with zinc over small hip rolls. Step-flash around all chimneys with ziuc, working it into joints of brickwork and makiug tight with oil cement. Flash elsewhere around building where required with best zinc strips, properly fastened, and elastic cement. On north and sonth ridge gables put up louvres behind screenwork, to be opened or closed by means of cords, pulleys, &c., operated from attic floor. Floors of small balconies on south bay, and roof dormers of hard pine, to be laid 1/4 inch open.

Ventilators. Balcony Floors. Side and Rear Fence. Build wooden fence on north and west sides of lot with stout, turned chestnut posts, 6 inches diameter, beveled; pine top rail, 2 x 5 inch; pine bottom rail, 2 x 5 inch, cut into posts, and 1 x 3 inch planed and pointed; pine pickets, set 3 inches apart, and all well nailed together. Feuce to be 4 feet high to top rail; posts set 3 feet in ground. Put up one dozen stout clothes-line posts and hooks on lot where directed.

Clothes Posts &c. Swill Locker. Build where directed ash and swill-locker of 1 1/4 inch matched pine plank, divided into three parts, with stout door to each division, hung and fastened with stout galvanized iron hinges and hasps.

Frames and Centers. Furnish for mason all necessary centers, skeleton frames, patterns, &c.; provide, put up and strike all necessary staging; provide, put up and remove all necessary door and window screens and barricades; set all nail-holes in exterior finish; smooth down and direct painter to prime all exterior woodwork as soon as up.

Setting Nail-holes. Interior Finish. All the interior finish is to be of the best quality of kinds of wood specified below, thoroughly kiln-dried, sapless, and of selected grain. All work to be according to details, put up in best manner, all nail-holes set, close joints, clean, sharp edges; chamfers and moldings to be thoroughly hand-smoothed and sandpapered, and protected from injury.

Kinds of Wood. The finish of various rooms throughout the house will be as follows: The laundry and back halls will be of pine shellaced, both sheathed 3 feet high; back stairs throughout of hard pine. Kitchen, pantries, &c., and toilet-closets, pine shellaced; kitchen sheathed 3 feet high. All front halls, vestibule, front stairs and chief rooms of first story, in Western ash, of even grain, free from streak or figure. Dining-room dadoed to hight of 3 feet 6 inches; vestibule, front hall and rake of stairs sheathed to hight of 3 feet 3 inches. Bath-room, second-story hall, alcove and attic stairs, in ash, as above specified; bathroom sheathed 4 feet high, others 3 feet 3 iuches; no sheathing up rake of stairs to attic. All other chambers and closets, with playroom and billiard-room in attic, to be finished in best pine shellaced.

Kitchen, &c. Principal Rooms & Stairs. Chambers.

Window Frames, Rebated Frames. Box Frames. Fit to windows in small dormers, north and east, aud transoms to east bay, rebated pine-plank frames and stool, 1 1/2-inch molded and lipped pine sash, hung to swing inside. Fit to all other wiudows box-pine frames, with hard-pine pulley stiles, beads and strips, accessible pockets for weights; outside staff molding to basement windows, 2-inch plank weather-stool, rebated, and pitching 1 1/4 inches; inside stop-beads of hard pine, put up with round-head blued screws. Mullions to have division in boxes between weights, to prevent clashing. Fit all windows with clear pine, lipped and molded sash, 1 3/4 inches thick in first story, 1 1/2 inches thick elsewhere, 1-inch muntins; all thoroughly framed, wedged and pinned, divided for glass as shown, and stained to imitate cherry. Sash to be double-hung, with cast-iron brass-faced pulleys, best white cotton line, and round iron weights well balanced. All sashes to be fastened with stout

Window Sash. Hanging Sash.

bronzed iron fasts, except three rooms in first story to be real bronze. Inside of window frames, when exposed, to be veneered to match finish. Fit frames, to all doors, of 2-inch rebated and beaded pine plank, veneered to correspond with finish of rooms. **Thresholds.** Thresholds of exterior door of 2-inch beveled hard pine; all other inside doors to have double-beveled 1 x 5-inch cherry thresbolds. **Blinds. Inside Blinds.** Basement and attic, where finished, to have windows hung with inside blinds 1⅛ inches thick, of pine, to shellac; framed and pinned, with rolling slats in lower half, put up with bronzed iron butts, catches and knobs. **Outside Blinds.** All other windows to be hung on outside with best 1½-inch framed and pinned pine blinds, divided and hinged so as to work without interfering; to have rolling slats in lower half, hung on wrought-iron L-hinges, and fitted with Shedd's patent fasts, put up complete.

Winter Sashes. Furnish and put up sashes to cover exterior of first-story windows of clear, 1½-inch pine, well framed, with molded sash, stained to imitate cherry. Inside edges fitted with felting, to make tight joints, and sashes to be arranged so as to be easily put up from inside by means of screw-eyes. Carefully mark and store in attic after being finished by painter.

Mosquito Frames. Fit mosquito frames to all doors and windows of exterior in best ¾-inch pine, framed and covered with best of fine wire netting, tightly strained. Frames for windows to slide tightly, outside sash in cleats or grooves; for doors, hung on outside with suitable brass latch, springs and hook. Stain frames to imitate cherry; mark and pack as directed for windows.

Upper Floors. Deafening Paper. Lay down one thickness of felt deafening paper, well lapped, over rough floors in first and second stories. Fur and carefully test billiard-room floor, to bring to a perfect level. Repair and leave under floor in good shape. **Hard Pine Floors.** The laundry, back halls, toilet-room, kitchen, kitchen closets, pantries, bathroom and billiard-room, to have upper floors of best rift-sawed hard pine, matched and blind-nailed; boards ⅞ inch thick, not less than 4, or more than 6 inches wide, and not more than four boards jointed at one break.

White Pine Floors. All other floors to rooms and closets, halls and passages, except in unfinished attic, to have upper floors of second quality, square-edged pine, well jointed and nailed, not over 7 inches wide and ⅞ inch thick.

Quality of floors. All floors to be thoroughly kiln-dried, free from large or dry knots, in parallel widths, without shakes, and well cut in, strained and smoothed to an even surface. **Borders, &c.** Cut for registers, hearths and landings, with mitered borders around same. Screw down upper and under floors over piping.

Stairs. Build front and rear stairs according to details and plans; to be well supported on 2-inch pine plank stringers, 1 inch apart, well spiked to walls, platforms and floors, landing joist to be kept thin. **Back Stairs.** Back stairs to have ⅞-inch hard-pine risers and treads housed into one another and molded nosing. Wall rail on one side of 2½ x 3 inch cherry, secured to stout, japanned iron supports. **Front Stairs.** Front stairs, from first story to attic, including landings, posts, &c., to be of best seasoned, straight-grained ash; **Treads.** 1⅛-inch treads grooved into ⅞-inch risers, with molded nosing and close-beaded and incised molded string. **Hand-Rail.** Double hand-rail, 3 x 4 inches, molded, well ironed at joints and fastened to posts with joint-bolts; 1¾ x 2-inch lower rail, **Balusters.** 1¾ inches long and short, square, scored, turned and twisted balusters, grooved to receive brackets; 1½-inch chamfered brackets under lower rail; **Newel.** 7 x 7-inch square, molded, chamfered, carved, turned and twisted newel; 4½ x 4½-inch square, turned and twisted posts, with turned drops. **Fitting Work.** Posts to be securely fastened to floors, rails and balusters, framed, bored and glued together; all carved work as indicated on first-story stairs, but omitted in flight to attic. Protect stairs from damage.

Dadoes & sheathing. Dining Room. Put up in dining-room a paneled dado of ash, 3 feet 6 inches high, with 8-inch molded base, two panels high, upper panel, 8 x 8 inches; 2-inch stiles and rails, raised and flush moldings, molded capping; dado flush with plaster face.

Vestibule, Halls, &c. In vestibule, front halls and alcove, first and second stories and up rake of first-story stairs, put sheathed dado, 3 feet 3 inches high, 9-inch molded base, 2 inches plain, alternating with 1-inch beaded, vertical strips, necking, 4-inch carved frieze and molded cap. Put up paneled work at foot of staircase flush with dado.

Bath-Room. Sheath walls of bathroom, to hight of 4 feet, with 3-inch vertical, beaded and matched strips of ash, flush with plaster, 8-inch molded base, plain cap. **Laundry Back Hall, &c.** Walls of laundry, back halls, rake of back stairs, kitchen and toilet-room sheathed flush with plaster, of finish to correspond with rooms or halls; to be 3 feet high, as specified for bathroom.

Wooden Beam. Put up in front hall, at foot of staircase, a wooden arch, of 16-inch drop from ceiling, 3 x 4 inch molded lower rail, 2-inch turned and twisted balusters, 4-inch carved bracket, 1 x 5½ inch molded pilasters, running to floors, with base. &c., complete.

Architraves. Principal rooms. In parlor, library, dining-room and front hall, first story, put up molded and carved 1 x 5½ inch architraves, with 3½-inch square carved blocks at top, and 1½ x 9 inch plain plinth blocks.

Rooms in 2d Story. Principal rooms and halls in second story to have 1 x 5½ inch molded and mitered architraves, with 1 x 9 inch plain plinth blocks.

Kitchen, laundry, &c. Rear chamber, bathroom, back halls, kitchen, laundry, toilet-room, finished attic, and all closets and pantries, to have 1 x 4½ inch plain architraves, no plinth blocks, and 1⅛-inch corner blocks, with beaded rosettes turned in.

Finishing. All architraves to match finish of rooms, put up in best manner, without splicing or cutting of edges to fit plaster.

Bases. Principal rooms. Put up in front hall of first and second stories, parlor, library and dining-room, a molded and beaded base, 9 inches high, above finish floor, with 3½-inch raised, molded cap. **Second Story. Kitchen, Attic, &c.** Principal rooms and halls in second story, not otherwise specified, to have 1 x 9 inch bases, 2½-inch molded cap. All other rooms and closets to have plain, molded ⅞ x 8 inch bases.

Window Stools. All windows to be fitted with 1-inch rounded stool caps, 4-inch molded aprons under, in principal rooms and halls, first and second stories; 3-inch plain beveled elsewhere. Moldings, &c., to be returned against wall, at end of caps.

Doors, Quality. Provide and hang doors throughout the house; to be of sizes indicated, of best quality, well framed and hardwood doors, veneered with ¼-inch clear veneers, ¾ inch thick on edges, over seasoned pine cores, and paneled as indicated.

Front Doors. Front and vestibule doors double, each fold 2 feet 6 inches by 7 feet 6 inches, by 2 inches thick. All paneled, molded, chamfered, and carved as shown, beveled and molded meeting stiles. Upper panel, in vestibule doors, and transoms to both doors, to be fitted with beads, &c., for stained glass.

First Story Doors. Doors in principal rooms and halls, first story, to be 2 inches thick, 7 feet 6 inches high, 7 panels, raised moldings; sliding doors to be 1¾ inches thick, flush moldings.

Second Story Doors. Doors in principal rooms and front hall, second story, to be 1¾ inches thick, 7 feet 3 inches high, 10-paneled flush moldings, as indicated on details. **Ventilators.** Doors opening into closets to have upper center panel slatted, in opposite directions, for ventilation. Bathroom, rear chamber and hall doors, as below.

Kitchen & Attic Doors. Fit all door openings in finished basement and attic, in back halls, pantries, kitchen and kitchen closets, and rear rooms, second story, with 1 foot ½ inch by 7 feet, 4-paneled flush-molded doors. Side-entrance doors, 2 inches thick, as per details.

Door Trimmings. Front Doors. Butts. Front and vestibule doors to have 4 x 4 inches base joint, acorn-tipped, ornamental bronzed-iron butts, three to each fold, with steel washers. **Spring Catches.** To be provided with top and bottom bronzed spring catches, on edge of meeting stiles.

Knobs. Locks. Night-Lock. Door knobs and trimmings of best ornamental Philadelphia bronze, plain, nickel-plated for outside of front door. Fit to both doors good, easy-working bronzed-face mortise locks, with duplicate keys; locks worth $4 each; also fit Yale night-latch to outside door, with keys complete.

First Story Doors. Doors in first story front hall, parlor, library and dining-room to have butts, knobs and trimmings, as specified for front doors, with bronzed-face mortise locks, worth $2.50 each. **Sliding Doors.** Double sliding doors between dining-room and library to be fitted with stout, anti-friction wheels, on overhead track of iron, bronze sunk handles, and bronze-face sliding-door pulls and locks, approved by architect.

Second Story Doors. Butts. Knobs. Locks. All doors to principal rooms and halls, second story, to be fitted and hung with 3½ x 3½ inch japanned acorn-tipped plain butts, with loose joints and steel washers, two butts to each door; door trimmings and 2½ inch knobs, heavy nickel-plated; 5-inch mortise locks, worth $2 each, brass-face plate and bolt, nickel-plated keys, complete.

Side Entrance Doors. Outside doors to back hall, hung as specified for second-story doors, with 5-inch mortise locks, worth $3 each, strong mortise bolts, and Yale night-latches. **Kitchen & Attic Doors.** All other doors hung on two 3 x 3-inch plain japanned loose-joint butts, plain japanned trimmings, 2¼-inch mineral knobs and mortise locks, as specified for second-story doors. No two keys or locks throughout house alike.

Fitting Hardware. All hardware put up with blued, bronzed, brass, plated or bronze screws, as required to match finish. Prices above specified for locks, &c., to be lowest builder's list, with necessary fittings, but not to include cost of putting on.

Base Knobs. Put up base knobs to all doors, of wood to match finish, with rubber buffers.

Closet Finish. Pantry, or Ch. Closet. Fit up china closet, or "pantry," on south side, with wide cherry main shelf, with 10-inch back-piece, locker under, sink, drawers and tray slides to the right. On north and east sides, fit up lockers and racks below main shelf, and china case, 5 feet high, above, with shelves 9 to 14 inches wide, molded cornice, and ⅞-double doors, beaded for glazing, sliding by one another, on brass tracks. Closet opening from china closet fitted with one row of hooks, 4 shelves and food locker, with double doors, covered with wire netting.

Kitchen Pantry. Pantry to be fitted with two barrel bins, wide doors, and hinged top, pastry board, and slide, case of 5 drawers, case of 12 small spice drawers, lockers, and 4 shelves on two sides, from 10 to 16 inches wide; also, one row double hooks.

Dish Closet. Cellar Closet. Dish closet fitted with zinc-lined pot and kettle locker, and 6 or more shelves 1 foot wide. Vegetable room fitted with wide, deep, open bins on two sides, with stout plank shelves over, to hight of 6 feet.

Linen Closet. Chamber Closets. Linen closet to have case of 4 deep drawers, two lockers, with let-down lids, small cupboards under (all under main shelf), with 4 wide shelves over. Closets in south chambers to have one case of 5 drawers, inclosed lockers, with shelves over, one row hooks and 3 shelves on opposite side.

Medicine Locker. Closet Hardware. Fit up medicine locker with shelves and drawers over bowl in parlor chamber. All other closets to have each one row of double hooks, with three wide shelves over, on two or more sides. All closet hardware, including hooks, hinges, spring catches, &c., of plain japanned iron; beaded

cleats for hooks, turned standards to support shelves where needed, and plain paneled doors and drawer fronts. Case up around bath-tub, and water-closet in bathroom, with ash, paneled fronts, double seat and paper box to water-closet, and woodwork around water-closet put up with brass screws, so as to be readily taken apart. Sheathe cistern over water-closet in ash. In toilet-room finish water-closet as specified for bathroom. Make four wash-stands, as shown on plans, with double tier of beaded drawers, sunk wood handles, recessed and paneled doors, and paneled sides where exposed. Build supply tank in attic over kitchen, 6 feet long, 4 feet deep and 3 feet wide, of 2-inch rebated pine plank, to be lined by plumber, fitted with hinged cover and stout padlock. Also build and put up one small tank, 1 foot 6 inches by 2 feet by 1 foot 6 inches, over water-closet, as directed by plumber. Put up all necessary beaded boards and strips, for exposed pipes, on walls and ceilings, and cover pipes, where directed, with neat casings, screwed on. Fit up strong frames for sink and tubs, supported by 3-inch turned legs; also clear pine flap-tables and towel rollers in kitchen and laundry. Build in fuel room two stout coal bins of matched pine, second quality, supported by stout posts from floor to ceiling, also provide one coal shute. Build, according to details, six mantels as specified below; also put up in kitchen, laundry, finished attic and rear chamber, molded wood mantel shelves, 3 feet 6 inches by 1 foot, with back-pieces, and 3-inch sawed and scored brackets. Mantels and mantel shelves to correspond with finish of rooms, put up in best manner, close joints, clean, sharp edges to moldings and carving, polished brass fittings and plain, polished, French plate mirrors. Parlor mantel to have jambs paneled, with twisted columns, three plate mirrors above main shelf, with narrow over-shelf supported by carved balusters and carved back-piece at top. Library mantel similar to parlor, omitting carved back-piece. Dining-room mantel to have turned columns in jambs, curved main shelf, upper shelf supported by twisted balusters, with mirror and double tier of drawers under, mirror over upper shelf, and side shelves with carved back-pieces.

Bath-Room Finish. Tub. Seat. Cistern. Toilet Room. Wash-Stands. Main Tank. W. C. Tank. Pipe Boards. Sink & Tub Frames. Tables. Coal Bins. Wood Mantels. Mantel Shelves. Workmanship Parlor Mantel. Library Mantel.

Parlor-chamber mantel to have paneled jambs, with twisted columns, carved and lettered frieze, mirror over main shelf, with narrow, side, upper shelves, supported on twisted columns; small wood seats on each side of splay, not upholstered. Library chamber mantel same as parlor mantel, with jambs like dining-room mantel.

Parlor Chabr. Mantel. Library Chabr. Mantel.

Dining-room chamber mantel to have turned columns in jambs, carved frieze, narrow upper shelf, supported on twisted columns and brackets, with plain wood back-piece under.

D. R. Chamber Mantel.

Do all necessary jobbing and fitting, patch up after other mechanics, reset all broken glass, clean out building, remove all rubbish and unused material, scrub floors and wash windows.

Final Jobbing Cleaning out.

Ornamental Iron Work.

Provide and put up, to outside of front-door transom, an ornamental, wrought-iron grille, as shown on door details. Furnish, with all necessary lugs and bolts, wrought-iron window guards to all basement windows, those in furnace and fuel rooms provided with stout iron hinges and padlock. Provide, as by details, seven wrought-iron finials for roof cresting; also a sun dial, on south side of house, with cast-iron stylus, and plate, accurately engraved with hours and fractions on arc of circle, to be put up in best manner and correctly adjusted.

Trans'm Grille. Window Guards. Finials. Sun dial.

Lathing and Plastering.

Plasterer is to examine studding and furring before laths are put on, and must notify carpenter to replace poor work, or he will be held responsible for surfaces and angles out of plumb or level.

Examination.

Fill in above sills and girts to top of first and second floor joists with coarse plaster and brick chips.

Rat-proofing.

Lath with half-seasoned pine laths, between exterior studding, from sills to plate, and between rafters in finished attic, for back plastering. Cover all above lathing with one heavy coat lime, sand and hair plaster, well troweled in, and tightly closing all joints.

Back Plastering.

Lath with best half-seasoned spruce laths all walls, partitions, stairways and ceilings, except in unfinished attic and basement. Laths to be set the thickness of a lath apart, not more than six laths to a break on ceilings, nor more than eight on walls, securely nailed, with ends under stairways double nailed.

General Lathing.

All the above lathing is to be plastered with best of two-coat work, except cellar ceiling, which will have one rough coat, well troweled down. Plaster to be carried in all cases to floors, except where walls are sheathed or dadoed. Plaster to be well mixed on the grounds, near building, at least ten days before using, to be thoroughly hand-floated, and finished true and plumb to floor; skimming to be done without joints. First coat of best Rockland lime, clean, sharp pit sand, and fresh, long, cattle hair, thoroughly mixed, well straightened and floated, so as to leave all angles and surfaces true and plumb. Second coat to be of lime and fine sand putty, put on after first coat is dry, and hard-troweled down to clean, smooth surface.

Cellar Ceiling. Mixing Plaster. First Coat. Second Coat.

Provide and put up in best manner ornamental plate centers on ceilings of three principal rooms and hall, first story, to cost $3 each; also stucco brackets, worth 75 cents each, in alcove arch, second story. Run molded and coved 8 x 10 inch cornices stucco cornices around ceilings of front hall and dining-room, also around ceilings of library and parlor, about 10 x 12 inches, with dentil course, and two bands of cast ornament. Plasterer is, at his own expense, to patch after all other mechanics; to guard against freezing of plaster; to provide and remove all temporary staging and screens, and leave work whole and clean upon completion of house.

Center Pieces. Bracket. Cornices. Patching. Screens & Staging.

Gas-piping.

To pipe the entire house, in conformity with rules of "Brunswick Gas Light Co.," with concealed wrought-iron pipes, of requisite size, with tight joints, all done in most thorough manner, tested and accepted by gas company's agent. No cutting of floor joist or girders will be permitted. Principal rooms and front hall, first story, to have drop lights; all other halls, rooms, toilet and china closets to have one or more side lights.

Piping. Drop lights. Wall Brack'ts.

Bells and Tubes.

To provide and put up the following bells, in best manner, with nickel-plated gongs of different sound, concealed wires, in zinc tubes, cranks, supports and pulls, to match hardware of doors in rooms or halls: One bell each from front and side doors to ring in kitchen, front door also to ring in second-story hall. Bell from second-story hall to ring in kitchen and rear chamber. Foot bell from dining-room to ring in kitchen. Bell from kitchen to ring in second story and attic halls.

Bells. Quality. Number & Kind.

Put up, in best manner, the following speaking-tubes, with concealed, soldered, tin tubes, porcelain mouth-pieces, whistles, and all other necessary fittings: One tube each from front hall, second story, to front door; one to kitchen and one to attic; also one from front door to kitchen, and from side door to second-story hall; all with mouth-pieces, &c., at each end.

Speaking Tubes. Quality. Number & Kind.

Furnace Work.

Provide and put up, under direction of patentee or maker, a portable cast-iron furnace, with all required pipes, registers, &c., complete. Furnace to be located where shown on cellar plan, to be 52 inches outside diameter, with outer frame and top of galvanized iron, to be fitted with fire-pot lined with firebrick, cast-iron dumping grate and ash-grate; cast-iron doors and frames to fire-pot, grate and ash-pit; provided with water-pan, regulating dampers, 8-inch galvanized iron smoke-pipe, carefully connected with flue, and all necessary castings, fittings and tools, including shovel, poker, clinker-bar, shaker, &c.

Location of Furnace. Fittings.

Put up from wall opening, under southwest piazza, to furnace, cold-air inlet, a galvanized-iron cold-air box, 15 x 26 inches, hung by stout iron supports to ceiling, and provided with all necessary valves, wire netting and fittings. Repair and plaster tightly around all openings of cold-air box.

Cold Air Box.

Carry all necessary hot-air pipes, from hot-air chamber, through collars, by horizontal and vertical runs, to outlets shown or required. Pipes to have tightly soldered joints, all necessary elbows, collars, dampers, &c., to be round, and of proper diameter, flattened where passing between studding, and kept from contact with any woodwork; put up in most secure manner, with wire or iron supports. Pipes passing up wooden partitions to have studding on both sides, adjoining pipe, covered with sheets of bright tin, securely fastened; protect all other woodwork near pipes with bright tin guards or shields.

Hot Air Pipes. Protecting Woodwork.

Register boxes of tin, set, with register frames, in plaster of Paris; wire netting in boxes of floor registers. Registers of cast iron, enameled, with ornamental grating, and movable slats, set in rebated soapstone frames. Parlor, library and dining-room to have 12 x 15 inch floor registers; front hall, on side of staircase string, one 15 x 18 inch upright register; pantry and toilet-room, 8 x 10 inch floor registers; three principal chambers, 10 x 12 inch wall, or upright, registers; and bathroom, 8 x 10 inch upright register.

Registers and Boxes. Size of Registers.

Do all fitting or jobbing necessary to complete work; reset cracked or broken register frames; fasten stamped-metal tags to dampers of hot-air pipes in cellar, showing rooms they control; thoroughly test furnace, and clean and polish all metal work around same.

Fitting. Damper Tags. Black Polish.

Plumbing.

To provide and put up, from best materials, and in most careful and workmanlike manner, all the plumbing shown on drawings, or herein specified, with all requisite pipes, connections, stop-cocks, traps, fixtures, &c., so as to make first-class work in every respect. The system to include forcing water from cistern, outside house, to attic tank, thence distributing it to two sinks, two wash-tubs, one boiler, one bath-tub, four bowls and two water-closet tanks; also hot-water circulating pipes from boiler to sinks, tubs and bowls; also all waste and soil pipes, from various fixtures, to main earthenware drain; and all necessary ventilating pipes for traps, soil pipes, receivers, &c.

General. Description.

Main supply pipe from cistern to be 1½-inch bore, wrought and tarred iron, with all necessary fasts and couplings, to run to tank in rear attic. Provide and put up, in kitchen, near sink, a Blank's patent, single, iron force pump, with air chamber, brass cylinder, valves, bearings, &c., complete, in running order, with all necessary connections with main supply. Line main tank, in attic, over kitchen, with best 14-ounce planished copper, smoothly and tightly soldered, and provided with standing overflow, connected with tell-tale to kitchen sink, ¾-inch bore, weight, 3 pounds per foot. All distributing and circulating pipes of best lead, of size specified, with all joints carefully wiped

Main Supply. Force Pump. Main Tank. Circulating Pipes.

and soldered, no putty to be used; put up with best hard-metal tacks and screws, no hooks to be used, nor any unnecessary or sharp bends in pipe allowed.

Soil and Vent. Pipes. Joints. Painted All soil and vent pipes to be of single thick cast iron, of size below specified, fitted with all necessary bends, turns and elbows. All joints to be run and calked in molten lead, after being put in place (no cement or putty allowed in any part of plumbing); to be covered with two coats red lead, or asphalt, and securely hung to joists and walls with stout iron stays and hangers. No tin or zinc piping allowed for vents or other plumbing work.

Main Soil pipe Main soil pipe to start from connection with sewer, outside cellar wall, thence to cellar ceiling, along underside of ceiling, with branch to toilet closet unto point beneath pantry sink; thence vertically between studding, with branches to pantry and bathroom, to a point 3 feet above roof outlet, with iron ventilating cap, all 4 inches in diameter throughout.

Branch Soil pipe Branch to toilet-room to run, with necessary pitch, along cellar ceiling to point near toilet-room water-closet; thence vertically, between studding, with branches, to toilet-room, and bowl wastes, with outlet cap, &c., as specified for main pipe. To be 4 inches in diameter throughout.

Kitchen Waste. Kitchen waste to be 2-inch cast iron, with 2-inch vent to roof, as above specified; to run vertically in studding behind sink, with branches to sink and laundry trays, carried below laundry floor, with regular pitch to connection with earthenware drain outside cellar wall.

Laundry tubs Fittings Put up in laundry two soapstone wash-trays, 2 feet by 2 feet by 15 inches (no backs). Soap racks, brass strainers, cesspools, plugs, chains and holders; ¾-inch lead hot-and-cold-water supply pipes; weight, 3 pounds per foot; brass ground cocks to each tray; 1½-inch 4-pound lead waste to main iron waste, through 6-inch round lead trap, with accessible screw.

Kitchen Sink. Fittings In kitchen provide and set a soapstone sink, 22 x 42 x 6 inches (no back), with soap rack, brass strainer and cesspool; ¾-inch 3-pound-per-foot hot supply; cold supply direct from main supply, with ground brass cocks; nozzle threaded for hose, and brass shut-off cock to tank in main supply above kitchen cock. Brass ground cock to hot-water supply; 1½-inch lead waste, 4 pounds per foot, to main iron waste, through 6-inch round lead trap, with accessible brass trap-screw.

Hot Water Boiler. Fittings Provide and put up, complete, with all necessary fittings, on cast-iron stand, a 40-gallon, 16-ounce copper tinned bath boiler, dome head, fitted with brass sediment cock, finished brass hot-water connections with range when desired; ¾-inch 3-pounds-per-foot hot and cold supply, circulating pipe, steam vent, &c. Boiler to supply all hot-water works.

Pantry Sink. Fittings In pantry, set, in box of plaster of Paris, a planished copper sink, 14 x 20 inches, 6-inch oval bottom, with ¾-inch 3-pounds-per-foot hot and cold supplies, through pitcher cocks; bowl to have overflow, strainer, plug, chain and holder; to have 1-inch 3-pounds-per-foot lead wastes from sink and overflow, through lead Bowers trap, vented by 1½-inch lead pipe to main vent pipe above bathroom to main soil pipe.

Toilet Room. Hopper Closet. Cistern. Slop Safe. W. C. Vent. & Outlet. In toilet room put up water-closet, as per Plate 202, Mott's catalogue for 1881; an enameled-iron Tucker short hopper, with enameled trap, vented by 3-inch iron branch to vent pipe, painted; No. 2 waste-preventing cistern, with bracket and chain, enameled slop safe and wood seat to operate cistern. Supply cistern and hopper with 2-inch 4-pound lead pipe. Carry 2-inch iron vent pipe from branch to hopper trap, through studding, to a point 3 feet above roof, with ventilating cap.

Wash Bowl. Fittings Slab. Bowl Piping Trap Also set in toilet-room a wash-bowl of marbled Wedgwood, 14 inches internal diameter, with overflow, chain, plug and holder, complete. To be set in dished and polished Tennessee marble slab, with molded edges and 12-inch back and side pieces, as specified for slab, all securely put up with plaster of Paris and silver-plated screws. To have ¾-inch 3-pounds-per-foot hot and cold supplies, through ½-inch turning cocks, with all couplings and fittings. Waste from bowl and overflow, 1½-inch bore, 4 pounds per foot, connected with soil pipe through 2-inch Bower's lead trap, with 1½-inch lead vent to 2-inch main iron vent. Line up under water-closet and bowl with 3-pound lead, turned up 2 inches and connected by ¾-inch tell-tale with cellar ceiling.

Cha'b'r. Bowls. Waste to South Cha'b'rs Cha,b'r. Bowl Vents. & Tray. Troughs Bowl over toilet-room fitted with supplies, wastes, trap, tray, &c., as specified above, with 1½-inch vent to main 2-inch vent pipe. Bowls in south chambers fitted up as specified for toilet-room bowl, with 2-inch iron waste, carried between second-story floor joist, and connected with toilet-room soil pipe; waste pipe to be carried above roof, as specified for other soil and vent pipes; 1¼-inch lead vent from bowl waste, to enter 2-inch iron waste above bowl case. One lead tray under bowls, with 1-inch tell-tale to basement ceiling. All wastes and supplies crossing floors to be laid in zinc-lined troughs, with ¾-inch tell-tale to basement ceiling.

Bath-Room. W. C. Connections. Lead Tray. Tank. Fittings In bathroom put up, complete, one Demarest oval, short flushing rim, earthenware, glazed hopper and trap, with 3-inch vent; all connections of brass soldered on. Connect hopper trap by 4-inch cast-lead trap with main soil pipe. Vent from earthen trap to be of 3-inch cast iron, carried above roof, as specified for soil pipes. Hopper to be set in lead tray, with tell-tale as specified for bowls; under seat to be of planed Vermont slate. Tank to be lined with 14-ounce copper, planished and soldered, and fitted with iron service box, overflow to service box, ball-cock, levers, valves, &c.; ¾-inch 3-pound lead supply, 1½-inch lead 4-pound-per-foot delivery pipe from service box to flushing rim. Fit in upper seat porcelain cup, silver-plated pull, levers, cranks, wires, &c., connected with supply valve of service box. Wood tanks provided by carpenter.

Bath Tub. Fittings. Fit up on wooden frame a 5-foot best quality bath-tub, lined with 16-ounce tinned and planished copper, fitted with overflow, strainer, plug, chain and holder; ¾-inch hot and cold supplies, 3 pounds per foot; ¾-inch ground cocks; 1½-inch 4-pound lead waste to soil pipe, with 1-inch 3-pound waste from overflow and Bower's trap, with 1½-inch vent to main iron vent.

Plated Work. Plugs, chains, holders and cocks or faucets to tubs, bowls and pantry sink to be of best white metal, heavily silver-plated and polished.

Soil pipe Fittings Soil and vent pipes above roof to be made tight around shingling, with sleeve and 4-pound lead deck well tamped up over joints.

Cutting & Protecting. Do not cut any timbers, rough or exposed woodwork or damage plaster. Box and wrap with felt any exposed pipes to prevent freezing.

Testing. Make any further connections or do any jobbing necessary to complete the works, test pipes for leakage with oil of peppermint, and thoroughly test and leave all apparatus in complete working order.

Glazing and Painting.

Glazing. Stained Glass. Glaze all windows, transoms and door sash with best double-thick German glass of sizes shown, bedded, puttied, lock-puttied and pinned in best manner, and left whole and clean at completion of painting. Transoms over front and vestibue doors and upper panels to vestibule doors glazed, as per details, with rolled and painted cathedral glass to cost $2 per square foot, leaded and soldered, with lead and cement joints bronzed twice on both sides.

Painting Quality. Do all painting, shellacing and varnishing, as specified below, in the best manner, using only pure linseed oil, best American white lead, best English pigments, pure shellac and best copal varnish. No calcined colors, fish or other spurious oils permitted.

Exterior Priming Prime all exterior woodwork except roofs as soon as put up, with one heavy coat lead and oil of such color as architect may direct.

Puttying. When directed properly putty all exterior nail-holes and crevices, prime large knots and otherwise prepare woodwork for final painting.

Roof. Painting Paint roofs of house and piazzas two coats best Venetian red in oil.

Metal Work. Paint all exterior metal work three coats, first coat of red lead.

Exterior painting All other exterior woodwork, except otherwise specified, to be painted two coats lead and oil in four colors, one tint for clapboards, one for shingles and two for belts, rails, posts, casings, &c. Piazza ceilings to have one coat orange shellac and one coat varnish, rubbed down.

Blinds. Exterior blinds to have three coats lead and oil of tint selected.

Fence. Side and rear fence to have two coats lead and oil.

Sashes, &c. Brick-Work. Piazza Floors. Exterior sashes, winter sashes and mosquito frames to be drawn in dark green, two coats. Oil one coat, raw oil all exposed underpinning and chimneys. Oil twice with raw linseed oil, hard pine floors of piazzas, the treads of steps and floors of balconies.

General. All exterior painting to be done in clear, dry (not dusty) weather, and exposed work to be properly protected until dry and hard.

Interior Work. Puttying. Priming Ash Finish. Putty-stop all inside work, after first coat of oil or paint, color putty to match finish woodwork. Prime all knots, pitch and sappy places with heavy shellac. Smooth down all rough woodwork with sandpaper, and otherwise prepare interior work for finishing. The ash finish of parlor, library, dining-room, mantels, bathroom, front halls, staircases and alcove, to be thoroughly oil-filled and finished in natural color, with three coats best white shellac, (4 pounds to a gallon of alcohol), rubbed down with emery cloth and oil; then one coat linseed oil, rubbed down to finish surface in pumice-stone and 00 sandpaper, wiped dry, and cleaned off in spirits of turpentine. Each coat to be well dried before succeeding one is applied.

Pine Finish. Orange Shellac. Cellar painting Oiling The pine finish in chambers and closets, finished attic, and china closet or pantry, to have three coats best white shellac, carefully rubbed down to finished surface with sand-paper, cloth and oil. Pine finish of laundry, back halls, toilet-closet, back stairs, kitchen, and kitchen closets, to have two coats best orange shellac, and two coats best copal varnish, well rubbed down. Cellar woodwork painted two coats. Pulley stiles, thresholds, hard pine floors and stairs, and face brickwork about mantels, to have two coats raw linseed oil.

Sashes. Wall painting Decorating. Inside of sashes twice varnished with best copal varnish, and exposed iron, lead, or brass pipes, with fasts, to have one coat varnish. Prime once in litharge, and paint three coats lead and oil, of tint selected, all walls of laundry, back halls, back stairs, toilet and bathroom, kitchen, kitchen closets, and china closet or pantry. Tint, in distemper, ceilings, cornices and centers of front halls, parlor, library,

Frescoing. and dining-room with three colors, plain line borders around above rooms, with stencilled borders in parlor and library.

Picture Mould. Put up gilded 1½-inch moldings for pictures, around walls of front halls and parlor, polished ash for library and and dining-room, and ebonized for three chambers. Put up

Dado Rail. an ebonized cherry 3-inch molded dado rail around walls of parlor and library.

"JUMBO."

SPECIFICATIONS.

For building a house shown in "Carpentry and Building," No. 43, July, 1882, from drawings by Edward S. Hammett, architect, Albany. Submitted by "Jumbo."

Mason Specification.

The several plans and drawings herein referred to are as follows:
Basement plan.
First-floor plan, 10 feet above cellar bottom.
Second-floor plan, 11 feet 9 inches above first floor.
Attic-floor plan, 8 feet in clear, or ceiling above floor.
Front or east elevation.
Side or south elevation.
Rear or west elevation.
Roof plan.
Perspective viewed from southeast.

Details as follows: Piazza, piazza ceiling and rafter, cresting and finial; section water table; second-story string course; section through dormer; section through front gable; architrave second story; hand rail main stairs; style and rail molding for second-story doors. Flush molding for sliding doors in first story and of principal doors in first story. Section through main cornice and upper string course. Elevations and sections for mantels to parlor, parlor chamber, dining-room and dining-room chamber. Arch over stairs, first-story doors, first story, second story, outside doors. Principal entrance one-half inner front vestibule doors. Elevation main stairs and wainscoting in vestibule. Baseboard in first and second story. Upper corner first story architrave. Wrought-iron guards for cellar windows.

General Conditions.

All work described in the specifications or shown on the drawings, and all the work dependent upon or necessary to the complete finish of the work so described or shown, is to be executed in a thorough, substantial and workmanlike manner, and of the materials best adapted to the purpose, where such work or materials are not specially mentioned.

All the work shown on the drawings, the dimensions of which are not figured, is to be according to the scale to which the drawing is made, but figured dimensions are in all cases to be followed, though they may differ from the scale measure.

The contractor shall give to the proper public authorities all requisite notice; obtain all official licenses for temporary obstructions, inclosures, openings into common sewers, water-pipes, &c., make good any damage occasioned to adjoining premises, and shall also construct proper inclosures and fences for the protection and convenience of the public during the progress of the works, and keep up lights, &c., required by night, to the satisfaction of the proper local authorities.

The contractor shall at all times effectually cover and protect the work, or the materials to be used therein, from damage by the weather, and shall repair and make good any and all damages that may occur thereby, or otherwise; and shall procure adequate insurance against fire to an amount satisfactory to the parties of the second part, and the policy or policies of insurance shall be assigned to the said party of the second part as security for money advanced.

The said builder is to do all work of every kind that may be necessary for the perfect completion of the work proposed, for the rectification of any failure from whatever cause arising, and for the well maintaining, sustaining and supporting the whole of the work, as well as the alterations and additions, should such be made, so that the whole may remain secure and firm.

The contractor shall remove all dirt and rubbish from time to time, as the good of the work may require, and shall make the premises neat and tidy in every respect, and deliver up the same at the completion of the work in perfect order, and condition fit for use and occupation.

Excavation.

Remove from site of building the sod and loam to the depth of one foot, to be placed on lot where directed. Excavate for cellar, cesspool and trenches for soil or drain pipe to the depth and dimensions requisite to accomplish the end, as indicated on foundation plan.

Trenches.

Trenches for walls to be the thickness of bed stone below cellar bottom. All excavated material to be deposited on lots to be used in grading up around the building after the foundations are in. Grade incline ¾-inch to 1 foot.

Drain Pipe.

Provide and lay 6-inch cement drain pipe to cesspool and connect the same with soil pipe in cellar. Refill all trenches and grade up around the building and leave the premises in a neat and tidy condition.

Foundations.

Provide and set good flat bed stone for all walls, chimneys and piers in cellar 2½ feet wide and not less than 8 inches thick, and build thereon a good junk stone wall 2 feet thick, laid dry; at least one-third of stone to run through the entire thickness of wall and to be well faced on inside, regular and compact on outside.

Provide and set 18 x 18 inch beds for supports to piazza, started 3 feet below surface of ground, and cistern if desired, and brick walls in cellar.

Underpinning

To be a brick wall 12 inches thick, 3 feet 6 inches in hight above grade, laid in mortar, neatly pointed, and extended below grade the same dimensions as above, to a depth of at least 4 inches to the top of foundation walls, the top of said foundation walls being 5 feet above cellar floor, making 8 feet 10 inches total hight of cellar in clear of floor joist, as indicated by elevations and area for steps to cellar, Fig. 3.

Pointing,

All foundation walls to be smoothly pointed on inside with suitable mortar.

Cesspool.

Build cesspool, where directed, 6 feet diameter and 7 feet deep, laid up with rubble stone and covered with 3-inch plank, top plank to be 6 inches below grade.

Brickwork.

All brickwork used in the building to be good, sound merchantable quality, and those for the exterior work to be selected of a uniform tint.

Catchment Basin.

Build catchment basin as shown on cellar plan, 3½ feet diameter and 4½ feet deep, with overflow as shown, with cover of 3-inch plank resting on top of wall raised 6 inches above grade; also trap door, 18 x 20 inches, for purpose of access to inside as occasion may require.

Rain-Water Cistern.

Rain-water cistern, where desired or shown, of hard brick and cement; the walls to be 8 inches thick, circular on plan, 10 feet in diameter and 10 feet deep; crown to be 2 feet below surface, put two courses on the bottom; plastered with cement outside and in, and made and warranted tight for water; cistern to be arched or domed over, with circular opening at top, 2 feet in clear, with iron well-curb and cover; the curb to be 6 inches above ground. Provide filter to suit architect. Cut in the same in proper manner for tile pipe from conductors, for plumbers' supply pipe and for overflow in cesspool, provided expressly for this purpose, of small dimensions, to allow overflow to soak away in ground free from contamination of water, from gas or otherwise, in case of its being connected with sink or sewer drainage. Construct in bottom of cistern a brick filter in form of a pyramid, say 2 feet high, 1 foot wide on bottom and 4 inches wide at top, and capped with brick and cement, leaving the walls not cemented other than at the joints; build pipe, or pipes, into the walls of filter, so as to draw water by pump from inside of filter. It is found that water leaching through pores of brick in this way makes a good filter. A double wall built in same way, with 2 inches space for charcoal, affords additional purifying influence to the water, as well as healthful for drinking purposes, which, combined with softness of rain water as compared with well water, is preferable for household use.

The Bricks Used for this Purpose Being Such as Have Sand Sufficient to make them Porous.

Connect the down spouts from the roof with this cistern, and provide an overflow, same as to the catchment basin, leading to a small opening in the ground, walled up with dry rubble and covered with plank and earth, so that the surplus water may soak away in the ground.

Chimneys.

Build and top out chimneys as shown; all joints to be thoroughly filled with mortar and all flues to be smoothly plastered, and outside of chimneys to have a good coat of mortar to the underside of roof boards.

Color of Mortar.

All brick to be laid in mortar composed of best Eastern or Sing Sing lime and clear, sharp sand. Mortar for exterior course of chimneys and other outside brickwork to be colored brown with Prince's Metallic Paint to the amount of 50 pounds to a cask of lime.

Ash-Pit.

Provide and build ash-pit by building into bottom of kitchen chimney a 10 x 12 inch cast-iron door, and one 14 x 16 inches for ash-pit under parlor chimney.

Sifting Grate.

Provide and fix for each fire-place on first floor a sifting-grate, connected with ash-pit below.

Thimbles.

Provide and fix into chimneys where needed 6-inch sheet-iron thimbles, with stops, and brick up around the same so they will not come in contact with any woodwork.

Lath and Plaster.

Lath all parts of the improvement in basement, first story, second story and third story narrow laths, selected and used for ceilings, soffits of stairs, &c. All laths to be made of best sawed spruce, free from imperfections, put on with five nailings; joints properly broken once in 7 or 8 inches on walls and every lath on ceiling. Outside walls to be lathed down to floor.

All the above to be plastered with a good coat of lime, sand and hair mortar, and finished with skim-coat of fine sand and lime, except those on first and second floor, which are papered or tinted, also excepting such ceilings as are to receive third coat of hard finish.

The rooms to be papered on first floor are parlor, library and dining-room and hall, and in second story the four chambers and hall.

Ceilings and Walls.

The ceilings of all rooms that are papered are to be hard finish. All angles to be sharp and regular in form. Walls to be plumb, and

in all cases to extend down to the floors. Lime to be best Eastern or Sing Sing.

Centers.

Put up three neat and appropriate centers, of such pattern as selected by the superintendent.

Deafening.

Cover platforms between timbers put in by carpenter with 1 inch of good, tough hair mortar for all floors.

Paving.

Pave cellar bottom and all areas with best quality paving brick on 3 inches of fine sand, the interstices well run in with liquid cement.

Finally.

Whitewash walls in laundry and do all necessary mending of walls after other craftsmen, and deliver the mason-work up in thoroughly good order at completion. Make the floors broom-clean from time to time, as required. Also remove all masons' materials, waste and rubbish accumulated during the progress of the work, from off the premises, and leave everything in a perfect, complete and satisfactory state.

Carpenter's Specification.

Drawings.

The several drawings herein referred to are as follows :
Front or east elevation.
Side or south elevation.
Rear or west elevation.
Plan of cellar and basement rooms.
Plan of first floor ; hight above cellar bottom, 10 feet.
Plan of second floor ; hight above first floor, 11 feet 9 inches.
Plan of attic floor ; hight of ceiling above floor, 8 feet.

There are also a full set of detail drawings for all exterior and interior work, which, with the above, show all dimensions and delineations of the work, which is to be thoroughly represented and set forth by detail drawings.

The drawings and all writing, interlineations, figures and detail drawings made or to be made as the work progresses, are to be considered a part of and as illustrating these specifications, and must be accurately followed. Where figures are not given the drawings must be carefully followed, according to their scale. On the plans blue designates stone ; red, brick ; yellow, wood.

The drawings and specifications are to be used for this building only, and they are the property of the architect. and must be returned to the architect at completion of the work. The contractor shall not make any alterations in the drawings. Should any error appear in them, he shall refer to the architect for correction.

General Conditions.

The contractor to give his personal attention and superintendence to the work, to furnish all transportation, labor, material, apparatus, scaffolding and utensils needful for performing the work in the best manner, according to the drawings and specifications. All the material to be of the best description. Should the contractor introduce any materials different from the sort and quality herein described or meant to be implied, it shall be immediately removed at contractor's expense, at any time during the progress of the work.

The works are to be executed in the best, most substantial and thoroughly workmanlike manner, according to the true intent and meaning of those particulars and the drawings referred to, and which are intended to include everything requisite and necessary to the proper and entire finishing of the carpenter's work, notwithstanding every item necessarily involved in the work is not particularly mentioned ; and all the works, when finished, to be delivered up in a perfect and undamaged state, without exception.

No part of the work to be underlet, unless by written consent of the owner. Otherwise, sub-contractors will not be allowed on the works.

All molded or cut work is to be made from the solid. All curved or circular work is to be either sprung on or sawed from the solid. No sawing-in will be allowed.

All moldings, architraves, &c., must be made in strict accordance with detail drawings. Any work that is not in accordance with details will be removed at contractor's expense, at any time during the progress of the works.

The contractor is to be responsible for all violations of law caused by his obstructions of streets, sidewalks. &c., with his materials, and pay all proper and legal fees and charges to public officers and neighboring proprietors, making good any damage occasioned to adjoining premises, arising from the construction, and carrying out all work as mentioned in the carpenter's specifications, and shall hold the owner harmless for any damage or expense arising therefrom, and shall clear the building and sweep it out before masons commence plastering, and, at completion of the work, shall remove all rubbish and other material from off the premises, scrub the floors, wash the windows, and leave the building fit and ready for occupation.

The carpenter to do all necessary woodwork, cutting, &c., for other craftsmen on the building ; to provide and set centers on which to turn arches ; also furnish suitable protection to all openings to keep out the cold and rain, and hang doors so that the building can be locked up soon as inclosed, by putting in temporary doors and locks ; shall provide suitable cases in which to keep plans and drawings during the progress of the work.

Timber.

The whole of the timber used in and through this building to be of the best of the several kinds, sawn square, well seasoned, and free from sap, shakes and other imperfections impairing its durability and strength, unexposed spruce, exposed white pine, unless otherwise specified.

Framing.

The frame to be what is known as a balloon frame, well nailed together ; second-floor girts to be notched into and well spiked to studs. Do all necessary framing around stairways and chimneys, properly mortised and tenoned together.

Frame Timber.

Framing timber to be of good sound spruce, pine and hemlock, as follows :

Sill to be of white pine, halved together at angles, 8 x 10 inches.

Studs.

Studs 2 x 4 inches ; 12-inch frame centers ; hemlock ; to be double at doors. Windows and angles, also well braced each way from angles.

Floor Joists—2 x 12 inches, 12-inch frame centers, joined into sill and to be spruce.

Plates.—Two 2 x 4 inches spiked together.

Rafters, 2 x 9 inches for pitch, crowned on to plate, to be of spruce ; also rafters 2 x 8 inches for deck, spruce.

Bearing Beams, 8 x 10 inch pine.

Collar, 1¼ x 6 inches for each set of rafters ; these form ceiling joist of second story, all well spiked together in the best possible manner.

Rough Boarding.

All trimmers and trimmed beams to have 1 inch added to their thickness, or double regular size. Cover outside throughout, including roof, with hemlock boards, put on with eightpenny nails, gang-sawed and laid edge to edge, well spiked to every stud and rafter, so as to tie the same in a first-class manner. This includes roofs of piazza, bay and porch.

Clapboards.

All portions of the sides that are clapboarded to be done with clear pine clapboards, white pine, put on with sixpenny nails, planed and rabbeted, with not less than 1¼ inch lap ; no sappy or imperfect boards to be used. The board to be underlaid with beaver brand, rosin-sized, waterproof sheathing felt, which place under corner and baseboards, casings, &c., so as to lap and make tight.

Corner Boards

White pine, 6 inches wide, running from top of baseboard to under side of string course, 6 inches below level of bottom of second-story floor beams, see Fig. 14 of details. Fit narrow corner boards, say 2½ inches wide, from top of string course upward, as shown in elevations, Figs. 2, 5 and 8.

Base String Course Casings.

Make base of water table as shown in Figs. 13 and 14.

Outside door and window casings, as shown, plain, with hip on same.

Blinds.

Outside blinds to all windows, except cellar, hung in two folds with best kind of hinges, and secured with best-style fasteners, and painted three coats.

Veranda

To have 4 x 7 inch pine sills, with 2 x 4 inch cleats nailed on, upon brick piers. Joists, 2 x 7 inches, 12 inches from centers, of spruce. Rafters, 2 x 6 inches, 16 inches from centers. Plates, 3 x 6 inches, edgewise, as shown in Fig. 11. Posts, 6 inches square, of white pine, turned as per detail Fig. 10. Rail, balusters, ornaments, brackets, &c., of white pine of best quality, as shown.

Ceiling on under side of roof with ⅞-inch battens, not over 4 inches wide, matched and beaded with 2-inch bead in angle, all to be clean pine.

Rafter feet to be chamfered as shown. Floors to be of matched Georgia pine battens, 3 inches wide and 1¼ inches thick, with ¼ inch to the foot pitch outward. Proper nosings wrought on face of same ; also steps, as shown, same number of rises as in plan, Fig. 4. Level of floor of piazza to be adjusted to a hight of one step, 8 inches below floor of vestibule, said floor level being determined with reference to detail Fig. 13.

Form panels on sides of steps, panels of lattice-work, as shown, formed under front and side piazza below floor. Construct roof of main entrance as shown in elevation, Figs. 2 and 5, with ornaments and finish in front and side gables as shown, with 2-inch plank cresting and finial, as shown on gable of roof, Fig. 5. Cover the deck roof of piazza, bay windows and back porches on stoop with best quality of roofing tin in use, well soldered and warranted tight for one year. Extend tin under woodwork, where practicable, or thoroughly nail to outside, using lead or rubber paint to make the connections water-tight with the house.

Stoop.

Build a stoop at southwest corner, as shown in plans, and south and west elevations, substantially same as piazza above described, with variations of ornament in gable south side.

North Side Entrance to Kitchen and Basement.

Construct stairs and appurtenances, as represented in Figs. 2, 4 and 8, on north side of house, substantially same as the various parts are described in piazza ; also the suspended roof with brackets, as shown Figs. 2 and 8, made of 3-inch pine as shown.

Hoods to Windows.

Construct hoods on top of windows, first story, extending shingles covering the sides of second story, as shown in elevations Figs. 2, 5 and 8, using best quality of Michigan pine, using shingles of uniform width of 12 inches rounded, with radius of 6 inches, as shown, and lapping 6 inches to the weather.

Furring.

Properly support and furr under stairs, and do any other furring required by the design.

Lumber.

The lumber to be of white pine, unless otherwise specified, well seasoned and dry and free from shakes, loose knots and other imperfections ; sash and panel work to be of perfectly clear lumber.

Main Cornice.

Foot of rafters resting on plates, as shown in Fig. 24 ; spiking on an extension of same 4 x 9 inches, chamfered and formed, as shown, to receive gutter ; also fit the finish in the angle near plate ; also bolt course, as shown in Fig 24.

Leaders.

Furnish all the required leaders of snfficient size to carry the water from the gutters to the cistern and tank in the attic. Said leaders to be firmly secured to building.

Window Frames.

To be made in the ordinary manner ; cellar frames to be made out of 2-inch plank, rabbeted for sash ; sash hinged to top, and to have suitable fasteners to keep open or shut ; all sash to be of seasoned pine 1½ inches thick, and double hung with best hemp cords, iron weights and 1¾-inch sham-axle pulleys, and to be glazed with English sheet glass ; all to be well bedded, bradded and puttied. Glass to be set with convex side out ; windows in dining-room on to piazza to be hinged ; window sill, 2½ inches thick.

Door Frames.

Outside door frames to be of plank rabbeted, and to have 2½-inch oak sills.

Floors.

Kitchen, kitchen pantry and back-entry floors to be of Georgia pine, battoned, ⅞ x 3 inches, blind-nailed to every beam ; all other floors of white pine, not to exceed 5 inches in width, to be well laid, joints broken and blind-nailed in a thorongh manner. Lay front hall with yellow pine and black walnut in alternate strips ; to have neat border (see plumbing) ; all pipes for plnmbing and gasto be put in before laying floors.

Wainscoting.

Walls of kitchen to be wainscoted 3 feet high, with beaded battons ⅞ x 3 inch, and to have neat-beveled molded cap.

Casings.

Case all doors and windows throughout, before plastering, with ⅞-inch casings, and trim hall, parlor, dining-room and library with 1½ x 3 inch band mold ; elsewhere, trim with 1 x 1¾ inch band mold. Windows in above rooms to be finished down to floor with framed and molded panel backs to match doors ; other windows to have neat stools and apron finish ; door jambs, 1 inch beaded on edges and rabbeted for doors. No moldings in closets.

Base.

Put down, after plastering, 9-inch molded base in principal rooms ; first floor, 9-inch plain-beveled mold ; elsewhere, as per Fig. 31.

Doors.

To be made in size and thickness as marked on plans, Fig. 22. Front door as indicated in elevation, Fig. 2 ; all other doors to be 6-panel ogee molded solid.

Saddles.

Put down molded hardwood saddles to all doors.

Stairs.

Stairs to cellar outside to be of 2-inch plank, ⅞-risers, well secured with and to plank, stringers fastened to side walls. Main stairs as shown, 1-inch risers, 1¼-inch treads, with returned molded nosings, to be well supported and rough bracketed. Steps housed into stringers ; newel posts, rail and balusters to be of black walnut as per details, see Fig 30. Back stairs, and stairs to attic to be box stairs.

Washtubs and Sink.

To be constructed out of 2-inch plank, rabbeted and put together with white-lead joints, and to have hinged lids ; these tubs to be 14 inches deep. Ceil np nnder sink with narrow battens beaded ; to have door properly hung ; ceil np splash-back 16 inches high, and cap same as wainscoting ; also place drip board complete.

Bathroom.

Ceil up under wash-bowls with narrow ash battens, and hang door to form a closet under. Wainscot walls of bathroom, 3 feet high, with narrow beaded ash battens, and cap with neat cap ; water-closet to be fitted up with seat, riser and miter-clamped flap, hung with brass butts. Bath-tub to be cased in most approved manner, all of ash.

Tank.

Construct, out of 2-inch plank, a tank in attic, over bathroom, 7 feet long, 5 feet 6 inches wide, 3 feet deep, framed, braced and snpported in a substantial manner. The bottom of tank to be furred and plastered in bathroom, and to finish 7 feet 6 inches in clear.

Pantry.

To have countershelf and four shelves above closet for barrel of flour, with lid in countershelf ; also pnt in two dove-tailed drawers, and pnt up one dozen pot-hooks. Closets to have shelves on neat strips, and donble wardrobe hooks, 8 inches apart, on neat molded strips.

Hardware.

Furniture to front doors to be Tucker bronze ; other doors, first floor, principal rooms, white porcelain ; other doors, mineral japanned ; sash fasteners to correspond. All small closets to have suitable catches, all drawers to have suitable pulls, locks, &c., complete.

All doors throughout to be secured with mortise locks, of best city make, brass fronts, bolts and keys ; ontside doors to have suitable shove bolts.

Put rubber-tipped doors-tops in base where required.

Hang all doors with loose-jointed butts of appropriate sizes ; all doors over 7 feet 6 inches high to have three butts each. Sliding doors to run on brass tracks and patent slot sheaves.

Front door to have bell connected with kitchen, with pulls, &c., complete.

Night-latch to front door combined with lock, and supplied with two keys.

Coal bins and partitions in cellar to be boarded up with matched boards, as shown ; doors in cellar to be batten doors.

Mantels.

Construct mantels for parlor chamber, dining-room and dining-room chamber of brown ash trimmed with mahogany in parlor and parlor chamber, and rosewood in dining-room and dining-room chamber. Library and library chamber may be of slate or wood, as per choice of proprietor. All hearths of slate, to have summer fronts, &c., complete.

Finally.

Complete all the detail ornamental work, brackets, &c., as shown on elevations 2, 5 and 8, also as shown in all the detail drawings, and necessary to fully complete the work ; to fully complete the same to the true intent and meaning of these particnlars is to be done without extra charge.

Slating.

Cover all the roof which has not been provided for on verandas, bay windows, &c., with best Bangor, Pa., black slate, of small size, laid with a lap of 3 inches of the third over the first, each slate to be nailed with two galvanized-iron nails ; lay nnder slate heavy tarred felt paper ; cover the ridges with zinc, also flash valleys and chimneys with heavy zinc, and secure with slaters' cement, to be a first-class job and warranted tight for two years.

Plumbing.

Furnish and connect with drains a 4-inch cast-iron soil pipe extend up to receive overflow from the tank ; connect with water-closet in bathroom through 6-pound lead trap ; soil pipe to be properly secured, and the joints calked tight with lead.

Supply Pipe.

Furnish a ¾-inch B lead pipe. Connect with the attic tank, and run to and connect with boiler in kitchen. Tank to be lined with 4-pound lead.

Sink.

If located as shown in plan No. 4, to be as large as the space will allow, of cast iron, galvanized ; supplied with hot and cold water, through ⅝-inch B lead pipe, ⅝-inch brass draw-cocks ; to have 1½-inch waste, properly trapped and connected. It is here suggested that if the location of the sink was on the north or west side of the kitchen, more space in length could be afforded for a sink of 20 x 30 x 6 inches, with shelves, pump, &c.

Pump.

Put in a combination lift and force pump, to cost $30. Connect same with cistern and well through 1¼-inch B lead pipe, provided with stop-cocks, one on each pipe, placed beneath the pump. Connect with tank in attic through 1-inch B lead pipe.

Wash Tubs.

Supply the two wash-tubs in laundry with hot and cold water, through ⅝-inch B lead pipe and brass thimble tray. Draw-cocks to have 2-inch main waste and 1½-inch branch.

Wash Bowls.

To be of Wedgwood ware, aud to have marble conntersnnk tops and surbases ; snpplied with hot and cold water through ½-inch B lead pipe and compressed double nickel-plated draw-cocks and plated plug and chain ; to have 1-inch lead wastes, properly trapped and connected ; lead pans to each properly trapped and connected.

Water Closet.

To be a Harrison No. B, with white marble pattern bowl, Wedgwood ware, plated cnp, handle and receiver ; also shut-off cock to regulate flow of water to the bowl ; to be fitted up in a proper manner complete.

Bath Tub.

To be Mott's enameled French bath, with nickel-plated fixtures, complete, with McFarland's patent waste ; 5 feet in length, supplied with hot and cold water through ⅝-inch B lead pipe and nickel-plated attachments as provided ; also rubber-hose shower-bath attachment ; waste, 1½-inch lead pipe, properly trapped and connected.

Put in the necessary stop-cocks over the boiler to shnt the water off from upper part of the house ; also put in a lead branch, connecting with drain, with stop-cock for emptying boiler. Also pnt in one draw-cock in cellar, and all other stop and draw cocks necessary to make a complete and first-class job. All pipes to be graded, so that if the water is shut off they will drain dry, and the whole of the work to be done in the very best and workmanlike manner, and delivered up in a complete and perfect state at completion.

Painting.

Properly stop and otherwise prepare for and paint all woodwork that is customary and usual to paint, both on the interior and exterior, two good coats of best white lead and raw linseed oil paint.

Grain the woodwork in kitchen and back hall light oak. Grain the dining-room and library brown ash. Paint the parlor and hall

in tints; elsewhere paint in one color. All hard wood to be oiled and rubbed down smooth. All grained work to be varnished.

Grain the front doors imitation black walnut.

Paint clapboards light olive. Paint corner boards, casings, &c., dark straw color. Pick out all chamfered and cut work in black, and do any other painting as required by the design and necessary to fully complete the same.

Heating and Ventilating.

Furnish and place in proper position sheet-tin pipes of proper size for conveying hot air from furnace, and where the pipes come in contact with wood protect the same with tin linings or iron laths.

Registers.

Place them where required with suitable frames. Those manufactured by Tuttle & Bailey Manufacturing Company, of New York City, being recommended as to quality and price. Have them of ample size so as not to retard the flow of heat, and have them properly proportioned to each other. Those registers used in first story to be placed in the floors. Those in second story to be placed in side walls.

Ventilating Registers.

Provide ventilating registers, and properly connect the same with chimney flues or other ventilating boxes tightly made, passing up the walls and discharging through the roofs like ventilating pipes. In those rooms, however, where mantels are introduced they may serve as bottom ventilating registers, but other ventilating registers near the ceiling must also be provided in order to let off too great pressure of hot air, but provide for the more important operation of extracting the foul air, which is always next the floor, openings at mantels like grates being preferable.

Furnaces.

Provide furnaces of ample capacity and abundant radiating surface, as being the most economical in the quantity of fuel, and to this end refer to John Hyslop, 206 and 208 East 29th street, New York.

Note.

My preferences, from actual experience, would be steam, as being most effective, most economical of fuel, less trouble to manage, less dust, more agreeable heat, more economical of room, and absolutely safe.

I would here refer to LeBosquet Brothers, 75 Union street, Boston, as parties who can be depended on, as furnishing for me last winter, every way satisfactory and reasonable in price, compared with many others, their No. 3 portable steam heater, direct radiation, that being the one deemed adequate, and most economical in plan.

Lighting and Fixtures.

Gas pipes must be carefully run throughout the building, before putting on the scratch coat of mortar, so as to accomplish any degree or method of lighting required, and all to be tested and left completely tight. Use best pipe of suitable size, and do the labor in best manner, leaving all ready to attach either a meter or a machine, as may be required. Reference for gas fixtures is hereby made to Fellows, Hoffman & Co., 631 and 633 Broadway, New York, for quality of goods and fair price.

Gas Machine.

Among the most recent and efficient machines invented for the purpose of lighting buildings is that manufactured by the Shaler Manufacturing Company, No. 4 Murray street, New York. Prices ranging from $30 to $350, which supply gas for from three to 100 burners.

Bells and Tubes.

Completely tube the building before plastering, for all bells or speaking tubes required to be put in by contract or otherwise, and when the house is ready hang all bells, provide and put up all pulls, wires, mouthpieces and speaking tube whistles required complete. Reference is had to Mr. W. R. Ostrander, 19 Ann street, New York, for goods in this line, which can be furnished at short notice.

Finally.

If the proprietor of this house would avail himself of valuable suggestions as to the internal decorations of the house as well as furniture, securing harmony with all, reference is had to Potter & Stymus Manufacturing Co., Forty-second street and Lexington avenue, New York City. Here you can hire culture in things beautiful, artistic education and the artistic mind, and it would be both wise and prudent to let this company take the house from the lath-and-plaster stage and finish and furnish everything, allowing their designer to visit the house in its raw state. From a vast museum of artistic samples and models he draws the themes that are to be realized in wood, marble and bronzes. Detail drawings are made of everything; carpets, walls, window frames, doors, curtains, mirrors, flooring and furniture, and the result is a harmonious whole, beautiful, interesting and reposeful. The advantages of this plan is that you avail yourself of facilities of a vast manufactory, everything being made of the best materials, and by the aid of the most perfect machinery. It is easy to see that the expense is less when one firm has entire control, as they save time, labor, cartage and materials. The cheapest, most simple and essential furniture may be as easily and successfully obtained by this means as by any other. The beautiful and artistic, aided by machinery, may be readily united with less cost as well.

House Furnishing.

For list of goods in this line, consult J. M. Falconer & Co., 42 Barclay street, New York City.

NEW PUBLICATIONS.

Drawing Instruments, How to Use Them and How to Take Care of Them. By an old Draftsman. Pamphlet, 4½ by 6 inches; 50 pages; illustrated. Published by the Industrial Publication Co. Price 25 cents.

This is a treatise on the management, care, capabilities and applications of a box of instruments as ordinarily made up, together with hints and suggestions on the management of drawing paper, drawing boards, T squares, scales, curves, set squares, colors and inks. The work is designed for the information of architects, engineers and draftsmen generally, but more particularly for beginners, amatcurs and non-professionals. The work cannot be said to contain anything that is new, or anything that has not appeared before in one shape or another. The object the author had in the preparation of this pamphlet, was to put into as condensed a form as was consistent with the nature of the subject, the knowledge and information necessary to convey to the reader a clear idea of the use, care and construction of drawing instruments and their accessories, and to place before him in inexpensive form matter pertaining to the subject in hand that is scattered through a number of expensive volumes, and therefore beyond the reach of persons of moderate means. The author has been fairly successful in carrying out his intent in the preparation of this work, and the pamphlet is one that will afford much desirable information to all who are commencing the subject of drawing. The extremely low price at which it is sold brings it within the reach of apprentices and young mechanics generally, in whose hands it will, we think, serve a very useful purpose.

How to Build Schoolhouses, with Systems of Heating, Lighting and Ventilation. By G. P. Randall, architect, Chicago.

This pamphlet, the frontispiece of which is a portrait of the author, is distributed gratuitously for the purpose of advertising his business. It contains a number of plans and elevations of schoolhouses, with consideration of their conveniences, together with a discussion of plans of heating, ventilating and estimates of cost. To all who are considering the subject of erecting schoolhouses this pamphlet is of interest. The biography of Mr. Randall, which it contains, since it shows the practical side of his life, will also be of interest to many.

THE "SANITARY ENGINEER."

The publishers of the *Sanitary Engineer* have brought out the fifth volume of this periodical, containing the numbers from December 1, 1881, to May 25, 1882, in a handsome quarto volume, and are offering the same to book buyers. The volume contains reviews, comments and criticisms by experts on events of special interest to health officers, architects, sanitary engineers, plumbers, gas-fitters, steam-fitters, builders and house owners. It is copiously illustrated with diagrams relating to plumbing, drainage, sewerage, steam-fitting, hot water circulation, water supply, &c. The price of the volume is $3, postpaid.

Cement Floors.

In several parts of the world, widely distant from each other, the workmen are in the habit of making cement and mortar floors of a remarkable degree of smoothness and solidity. The general principle involved in all the operations is compression by means of light hammers or mallets and constant rubbing of the surface, so that the mortar becomes exceedingly hard and solid. In India the floor is made by putting bricks on edge in mortar in the usual way for a foundation. Upon this is spread a layer, say 4 inches thick, composed of pounded bricks and freshly-slaked lime. The pieces of bricks are about the size of a pea. A mortar is then made of one part by measure of lime and two parts of the siftings of these same bricks, which also contains a small proportion of the larger size. This mixture is thoroughly mixed with water and spread over the substratum to a depth of perhaps 4 inches. After this the whole surface is thoroughly beaten with light wooden mallets. The beating is kept up for several days and the layer thoroughly consolidated. This reduces its thickness to about 3 inches. It is allowed to set for some time before putting on the cement. The appearance of the floor at this stage is somewhat rough, and this is considered an advantage, as it enables the cement to adhere more firmly. The cement is mixed with a coarse sharp sand, one part of cement, two parts of sand and a sparing amount of water. It is put on ⅜ inch thick and leveled. A little dry cement is powdered over the surface and rubbed in with a trowel. The final skin is secured by rubbing the floor with a slightly moistened trowel. This makes a hard and highly polished surface.

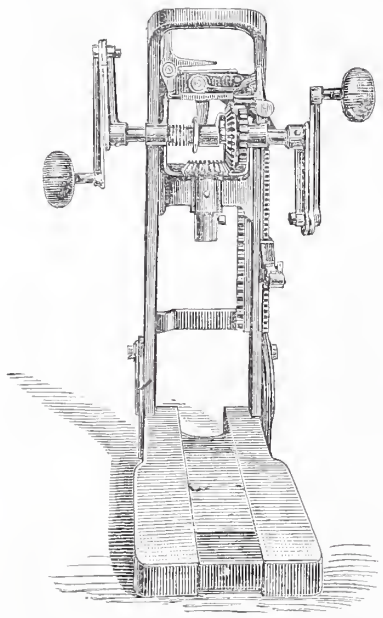
Ladders.—We are frequently in receipt of inquiries for the address of firms manufacturing ladders. We have recently received a catalogue from Messrs. C. E. Bishop & Co., of Hartford, Conn., who make a specialty of ladders of every description. We allude to this circumstance as likely to be of interest to our readers. The first article described in the catalogue is a portable extension fire-escape ladder. In the description of this article the statement is made that a ladder to extend 50 feet can be raised and lowered by one man of ordinary strength, and can be extended to any distance required within its capacity. Ladders of this description are made to extend in two sections to the hight of 100 feet. Besides ladders, the same firm make clothes horses, step ladders, wash benches, lap boards, flower stands, folding settees, towel racks, ironing boards, &c.

It is a singular fact than when a carpenter shingles a roof he adds to it, whereas a barber takes from the roof that he shingles.

NOVELTIES.

Improved Boring Machine.

The Wells Manufacturing Company, of Ashway, R. I., are now putting upon the market the improved boring machine shown in Fig. 1 of the engravings. One special feature of this improved machine is the construction of the cranks. By means of the peculiar joint uniting the two arms of the crank it is possible to make them of almost any desired length. As shown in the engraving they are at their shortest. By straightening the arms out, which is done simply by loosening the bolt at the joint, a crank several times the length of that shown is obtained, thus increasing the leverage. The machine is provided with an adjustment connecting the frame with the base, by which holes may be bored at various angles. The reverse motion of the machine by which the bit is withdrawn from the hole is positive in its action and very satisfactory in its working. The stop for limiting the depth of hole is shown at the right in the engraving. From the testimony of carpenters who have used this machine and who have compared it with other devices that they have employed, it would seem to meet a well-defined want and



Novelties.—Fig. 1.—Wells Boring Machine.

be destined to become very popular. The working parts of the machine are very clearly shown in our engraving, and will be readily understood by all who will examine the cut attentively.

Improved Steel Plumb Bob.

The Bergen Tool Co., of Batavia, Illinois, are introducing an improved case-hardened, wrought steel plumb bob, an illustration of which is presented herewith. Fig. 2 shows the article as arranged for carrying with the plumb bob slipped inside of the case, while Fig. 3 shows the plumb bob removed from the case. The case affords a convenient spool for winding the cord. This case is made of hard wood, and is hollowed out slightly smaller than the tool. The slots which are sawn in it, two of which are shown in the engraving, make it possible to slip the article in place, where it remains secured until it is forced out. The special feature to which the manufacturer directs attention, is that the point of this plumb bob is case-hardened, making it far less liable to injury than in the old style. The wooden shell protects the point, besides making the tool quite portable. Mr. Charles H. Besley, of 175 Lake street, Chicago, Ill., is the business manager of the company.

Hoop-Cutting Machine.

Fig. 4 of our engravings represents what as known as the Holt hoop-cutting machine, a device that is of considerable interest to coopers and all others who have anything to do with hoops. The working of the machine will be readily understood by reference to the engraving. Two disks, one above the other, revolve in opposite directions, each turning in upon the other. These do the cutting, and at the same time act as feed

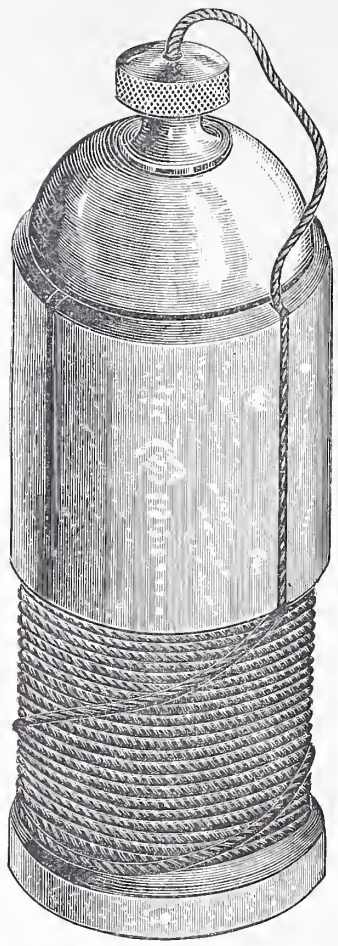


Fig. 2.—Improved Steel Plumb Bob in the Case Made for Carrying it.

rolls to carry the pole along. The disks are beveled upon one side, which keeps them pressed against the guide that regulates the thickness of the hoop. The guide is readily adjusted, so that any size of pole may be cut, from 3½ inches to the smallest pole used for the purpose. The arbors carrying the disks are connected by links, and the wear of the disks is taken up. One man can operate the machine readily. This device is on exhibition at the fair of the Manufacturers' and Mechanics' Institute, Boston, where its practical workings are being shown. The rate at which it it is being run is about 80 feet per minute. No previous preparation of the pole is necessary, except to trim the knots closely. The special advantages to which the manufacturers direct attention are simplicity, capacity, durability and safety. Neither chips, shavings nor dust are made by it. The hoop is cut from the pole an even thickness. The power required to drive it is about the same as that for an ordinary grindstone. Where power cannot be obtained, it can be successfully run by hand. The manufacturer is Mr. G. S. Foster, Concord, N. H.

Bailey's Copying Press.

Mr. L. Bailey, of Hartford, Conn., has recently patented a new copying press, shown in Fig. 5, and which is provided with several improvements calculated to effect a saving of time in copying letters and to simplify the process. It will be seen that the base of the press is of the usual form being, however, somewhat deeper, a drawer in the extra space holding the dampened blotting-pads, thus securing them from drying rapidly. From each side of the base rises an upright, the two being connected by a strong cross-bar, in the center of which is the compressing screw, reaching from the under side of the cross-bar to the upper side of the movable platen, the screw having a hand-wheel midway between the two surfaces. Inspection will show that the upper portion of the screw is right-handed, and the lower portion, which screws into the movable platen, is left-handed. Above the cross-bar is a tank for holding water, in which turns one of two rollers, the lower one being rubber and the upper brass, nickel-plated. A tube that may be turned down to permit the water to escape from the tank is attached, and the tank is covered. All the upper portion of the press is nickel-plated to prevent rust.

It has been found that the common blotting paper generally used forms the best material for damp pads for letter-copying, the only objection being that when wet they require careful handling. To obviate this difficulty Mr. Bailey places the blotting within a bag of thin cambric, thus securing all the advantages of the blotting paper, together with the durability of the cloth. The pads, being kept in the air-tight drawer previously mentioned, need not be passed through the rolls every time they are used, thus effecting an appreciable saving of time.

Convenient means are provided for withdrawing the old and supplying fresh water to the reservoir of the press. This should be done once every week, and all the copying pads kept in the drawer should be passed between the rolls quite as often, this operation forcing fresh water into and through the pads and preventing mustiness. If this

Fig. 3.—Plumb Bob Removed from the Case, showing the General Shape of the Article.

rule be followed the pads may be kept in good condition for a long time, and will always be ready for instant use.

Band Saw Sharpening Machine.

The importance of sharpening and setting band saws with great exactness has, within the past few years, been duly recognized, especially as the fracture of different parts has been found to be chiefly due to the unequal strains caused by unevenly sharpened and irregularly set teeth. This fact, combined with the tedious operation of sharpening saws by hand, has called forth the introduction of a number of saw-sharpening and setting machines, all of which are claimed to give satisfactory results. The machine, of which we here give an engraving, together with an explanatory diagram, has been in-

vented by M. J. Sudrat, of Bordeaux, France, and consists of a frame carrying a driving shaft with fast and loose pulleys, motion being imparted by means of a belt. The

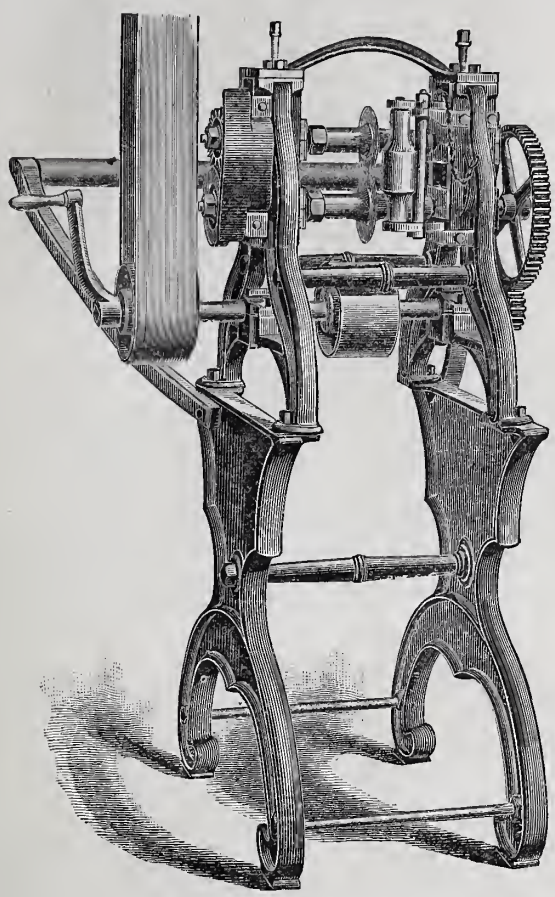


Fig. 4.—Hoop Cutting Machine.

driving shaft carries a crank-disk, the pin of which, acting upon a connecting-rod and lever, gives a reciprocating motion to a traveling table. The speed of about 40 revolutions per minute with which the driving shaft revolves, is multiplied by pulleys, the motion being communicated by belts, and the small emery wheel which is shown in the engraving, and which is carried by a bracket bolted to the back of the traveling table, makes about 1600 revolutions per minute. It will be seen that the band-saw is mounted on two horizontal flanged pulleys, so arranged that their axis may be separated or brought nearer together, as may be required. That part of the blade immediately beneath the emery wheel is held between two springs, the hight being regulated by a lever and de-

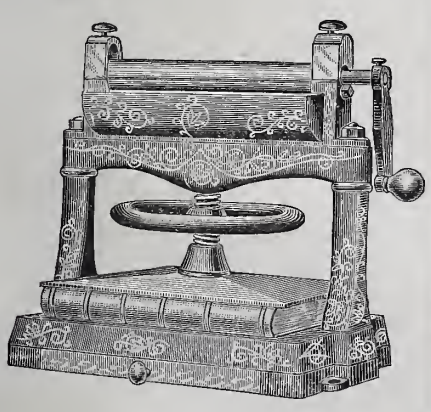


Fig. 5.—Bailey's Copying Press.

pending upon the desired depth of cut. At each stroke of the table the emery wheel, as it passes over the saw, deepens a notch; thereciprocating table, moreover, carries two punches which give the required set, and two slightly inclined triangular rods. As the table travels to and fro, each rod alternately enters a notch in the saw, and, owing to the slight angle at which it is set, causes the saw to travel over a distance of one tooth. At the end of each stroke, also, each punch alternately strikes a tappet, which gives the set to the teeth. It is evident that either the emery wheel or the punches may be suppressed, in case of the machine being required to set without sharpening or to sharpen without setting. The apparatus is constructed by M. E. Barras, of Paris.

Necessity of Good Foundations.

The importance of adequate foundations to a building is seldom overestimated. Architects and builders who have had experience in matters of this kind, and who have seen the baneful effects of poor work in this direction, need not be reminded of the importance of this part of a structure. In cities, where the price of land makes it an object to utilize every portion of the surface, and where business demands that the structure should be erected whether the ground is well suited to the building or not, there is some excuse for putting up buildings on marshy ground. Engineers resort to piles and various other expedients for providing a suitable foundation on which a building is to stand. Very grave errors, however, are sometimes committed in matters of this kind. One of the most notable to which our attention has recently been called is the Cathedral of St. Isaac, at St. Petersburg. Much of the soil of St. Petersburg is soft and marshy. In the erection of this building nearly a million dollars was spent in driving piles to obtain a solid foundation; but even with this the support was not firm enough for the massive building that was erected. The cathedral was finished more than 20 years ago. Its total cost was upward of $25,000,000. From time to time cracks have appeared in the walls, showing that the structure is settling into the ground. These cracks have recently increased both in number and size. There are fissures 3 inches in width in some places. Measures have been taken to lighten the roof by removing heavy bronzes from the cornices and dome, but the effect of this has been only to reveal the fact that the walls are damaged beyond the possibility of repair. Many consultations have been held by the architects and builders with a view of adopting a plan by which the cathedral can be made safe. These have resulted in nothing practical. The probability is that the whole of this costly edifice will have to be taken down.

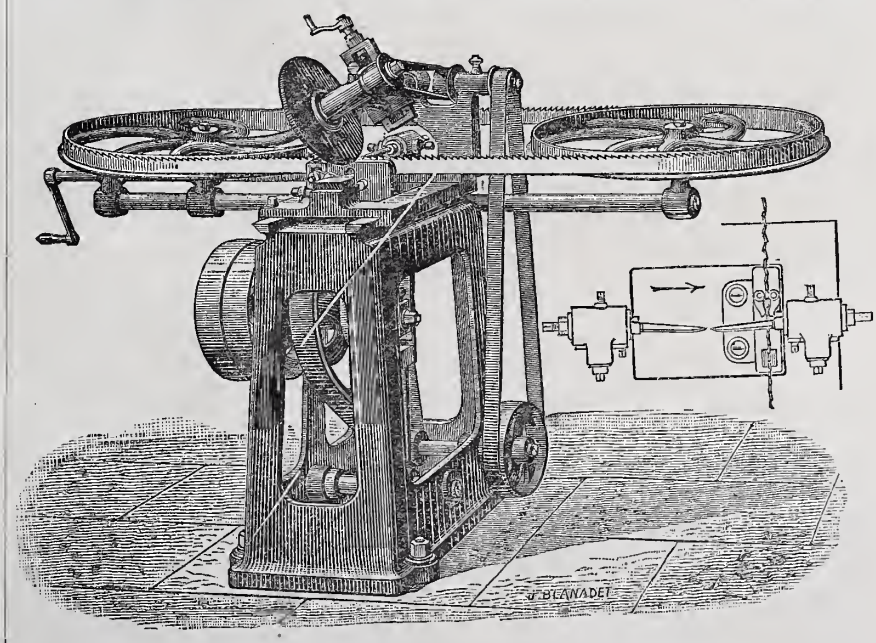


Fig. 6.—Band Saw Sharpening and Setting Machine.

A Correction.

In the April number of *Carpentry and Building*, page 64, we presented a study in floor plans, the first example being plans submitted in our fifth competition, under the *nom de plume* of "Convenience." By error in printing, the number of the plans No. 144 was inserted instead of No. 159, from which fact, by means of the list published on pages 66 and 67 of that issue, credit for these plans has been given to Mr. W. Howard Walker, when in fact it belongs to Mr. Edward J. Koch, of Milwaukee, Wisconsin. The cause of this error is easily explained. Both of the competitors, in this instance, submitted their plans under the same *nom de plume*, namely, "Convenience." By some accident in writing the captions under the floor plans, and also in the article, the wrong number was inserted. Our attention was not called to this matter until just before going to press with this number. Mr. Koch's modesty has caused him to lose the credit to which he was entitled all these months. We take pleasure in making the correction at this time, and make use of the occasion to express our regrets that the mistake should have been made.

Calculating Strains.

(Continued from page 147.)

All of the forces hitherto considered have been vertical; but when we treat of the action of the wind such is no longer the case. It was formerly usual to deal with the wiud as a vertical load added to the weight of the roof, snow, &c., aud the stresses were then obtained for the aggregate pressure. Tredgold recommended 40 pounds per horizontal square foot as a fit maximum of wind force to be provided for. This is manifestly incorrect, even if the added vertical force were considered as placed on one side of the roof only.

The wiud may be taken without error as blowing in a horizontal directiou; it exerts its greatest pressure when blowing at a right angle to the side of a building; it consequently acts upon one side of the roof only, loads the truss *unsymmetrically*, and sometimes causes stresses of an opposite kind in parts of the frame from those due to a steady load. Braces which are inactive under the latter weight may therefore be necessary, to resist the force of the wind.

It will not be right to design the roof to sustain the whole force of the wind, considered as horizontal, nor will it be correct to decompose the horizontal force into two rectangular components, one perpendicular to the roof and the other along its surface, and then take the perpendicular or normal component as the one to be considered, for the pressure of the wind arises from the impact of particles of air moving with a certain velocity, and those particles are not arrested, but only deviated from their former direction upon striking the roof. Nor will the analysis of a jet of water striking an inclined surface answer, for water escapes laterally against a comparatively unresisting medium, the air, while the wind particles deflected by the roof are turned off into a stream of similar air, also in motion, which affects their progress. It is evideut, therefore, that in order to obtain reliable data, recourse had to be had to experiments for the deduction of a formula.

Hutton's experiments have shown that for a given pressure per square foot against a vertical plane, the pressure exerted by a horizontal wind current against a plane inclined to its direction is perpendicular to its surface, and is greater than the normal componentof the given horizontal pressure.

From these experiments Unwin deduced the following values for the perpendicular or normal pressures per square foot on surfaces inclined at different angles to the horizon, the maximum force of the wind being taken as 40 pounds.

TABLE OF WIND PRESSURES.

Angle of roof.	Vertical rise per 1 ft. horizontal.	Normal pressure in pounds.
5°	.087	5.2
10°	.176	9.6
15°	.268	14.0
20°	.364	18.3
25°	.466	22.5
30°	.577	26.5
35°	.700	30 1
40°	.839	33.4
45°	1.000	36.1
50°	1.192	38.1
55°	1 428	39.6
60°	1.732	40.0

For steeper pitches the pressure may be taken as 40 pounds.

Although somewhat higher pressures have been registered in some rare iustances, it will be sufficient to provide against a horizontal force of wind of 40 pounds on the square foot, and to take from the above table the pressure per square foot of roof surface for that side of the roof on which the wind blows, which pressure will be exerted normally, that is to say perpendicularly, to the surface, and will be the only pressure on the truss from wind at that time.

To illustrate the foregoing, we shall now proceed to the analysis of a roof truss supposed to be under the action of a wind from the left.

The truss A B C D P S, shown in Fig. 22, is 67 feet span, its hight 15 feet, and the rafters are supposed to be 10 feet apart from center to ceuter. The length of one rafter will be $\sqrt{33.5^2 + 15^2} = 36.7$ feet; and allowing for weight of slates, thin boards, rafters, purlins and truss, 11 pouuds per square foot of roof, we have $36.7 \times 2 \times 10 \times 11 = 8074$ pounds for total vertical load upon each truss.

To find the normal wind pressure, we find, first, the vertical rise of the roof per foot horizontal, viz.: 33.5 : : 15 = 1 : : .447, and by interpolation in the above table of wind pressure, we find this to correspond to an angle of inclination of 24° 7′, and a normal pressure of 21.7 + pounds per square foot of surface. The rafters being 36.7 feet long and 10 feet apart, we have $36.7 \times 21.7 \times 10 = 7963.9 +$, or, iu round numbers, 8000 pouuds of normal wind pressure on one side of the truss.

In the strain diagrams given in Fig. 22, the two kinds of external forces are treated separately. The diagram for steady load needs no explanation. The supporting forces will each be 4037 pounds, and the weight on the joints of the rafters will be 672 5-6 pounds for the end ones, and 1345⅔ pounds for the others. The truss is drawn to a scale

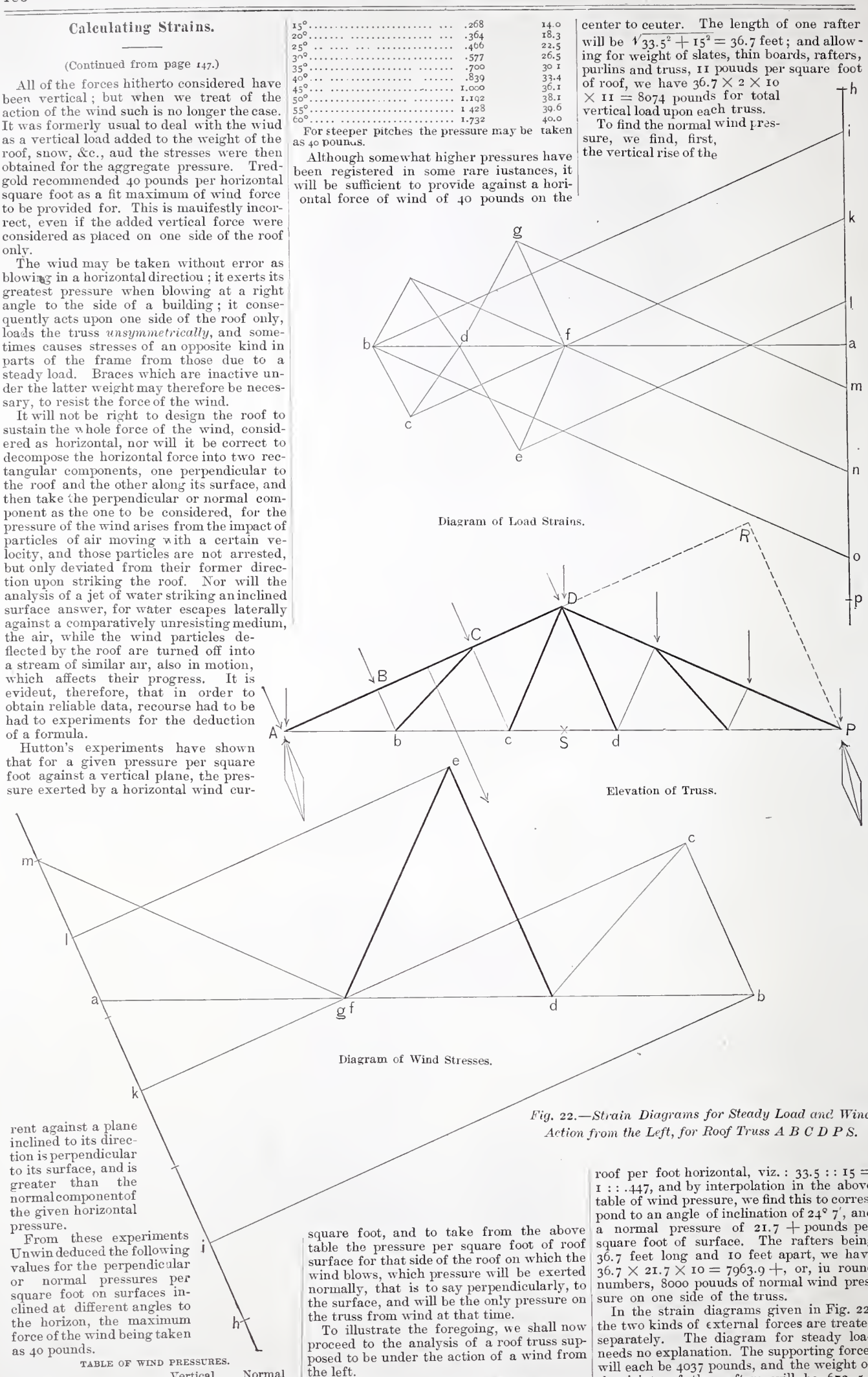


Fig. 22.—Strain Diagrams for Steady Load and Wind Action from the Left, for Roof Truss A B C D P S.

of 15 feet to the inch, and the strain diagrams to a scale of 2000 pounds to 1 inch. The above weights are laid off on the vertical load line and the diagram then drawn. The stresses on the various pieces for half of the truss are given in tabulated form below, and may be scaled off from the diagrams, the sign + denoting compression, and the sign — denoting tension.

We come next to the wind diagram. The normal pressure of 8000 pounds, distributed uniformly over the whole of the left side of the roof, will have its resultant, shown by the dotted arrow at the middle of the rafter. To find the supporting force on the right we may take moments about the left hand wall, remembering to multiply each force by the lever arm perpendicular to its direction—see Number 42, page 110—hence, calling the supporting forces by the letters at the heads of the arrows, we have :

$$P \times A\,R = 8000 \times \frac{A\,D}{2};$$

or $P \times 61.15 = 8000 \times 18.35$;

whence $P = 2401$ pounds

and $A = 5590$ pounds.

But since these arms A R and $\frac{A\,D}{2}$ are proportional to the span and the part of the horizontal tie cut off by the resultant, an easier way to get the supporting pressures due to an inclined force, is to prolong this force until it cuts the tie, when the two reactions will be proportional to the two segments into which the tie is divided, the larger force being on the shorter side of the segment, or the side on which the wind blows. The pressures on the joints will be 2666⅔ pounds each in B and C, and 1333⅓ pounds each on A and D, as denoted by the arrows perpendicular to A D. Draw next $m\,h$ by scale, equal to 8000 pounds, and perpendicular in direction to the roof ; divide off the reactions of the supports by means of the point A, and lay up the forces at the joints in succession, $m\,l$, $l\,k$, $k\,i$ and $i\,h$. This completes the polygon of external forces, the load or pressure lines being parallel to the direction of the forces.

Next we proceed with the construction of the diagram by the usual rules, remembering that wind alone is being treated.

After the joint C has given $l\,k\,c\,d\,e\,l$, the joint C gives $e\,d\,a\,f\,e$. Taking next the apex D and passing along $m\,l$, $l\,e$ and $e\,f$, we find that there will be no line parallel to D d, since $g\,m$ parallel to D d will exactly close on m, the point of beginning. As no stress passes through D d, the remainder of the bracing on this side of the truss can experience no strain, and therefore the compression $m\,g$ affects the whole of the right-hand rafter, while the tension $f\,a$ affects the remainder of the horizontal tie. To appreciate how this can be, imagine all of the braces in the right-hand half to be removed ; it is evident that the right rafter is a sufficient support to the joint D, conveying to the wall the stress $m\,g$, which compresses its upper end, while the tie A P keeps the truss from spreading. The stress triangle for the point P will therefore be $m\,g\,a\,m$. At another time the wind may be blowing on the right side, then the braces on the right will be strained as those on the left are now, and those on the left will be unstrained. The wind stresses are placed in the third column of the following table. As in this truss they are all of the same kind as those from the vertical load, they are added together to give the total or maximum stress. The force $m\,g$ being smaller then, while it is of the same kind as $l\,e$, is of no consequence, for with the wind on the right, the top joint of the right hand rafter would have to resist a stress equal to $l\,e$. A combination of the supporting forces at each end, as shown below A and P in the figure, by either the parallelogram or triangle of forces, will give the amount and direction of each reaction from the combined load. Wind on the other side will exactly reverse the amounts, and bring them on the opposite side of the vertical line :

Piece.		Steady load.	Wind.	Total.
Tie	A b	— 7,540	10,440	17,980
	b c	— 6,200	7,160	13,360
	c d	— 4,520	3,900	8,420
Rafter	A B	+ 8,280	9,530	17,810
	B C	+ 7,690	9,530	17,220
	C D	+ 5,760	6,550	12,310
Braces	D c	— 1,830	3,990	5,820
	C b	— 1,500	3,280	4,780
	B b	+ 1,230	2,667	3,897
	C c	+ 1,840	4,000	5,840

If the truss is simply placed upon the wall plates, and either of the supporting forces makes a greater angle with the vertical than the angle of repose between the two surfaces, the truss should be bolted down to the wall ; otherwise there will be a tendency to slide, diminishing the tension in the tie, perhaps causing compression in that member, and changing the action of the other parts of the truss.

If the weight of snow is also to be provided for, it may readily be done by taking the proper fraction of the stresses from the steady load and adding them to the above table.

The principal trusses should be braced together in the planes of the rafters to prevent wind, in a direction perpendicular to the gable ends, from producing any lateral movement. It is often customary also to tie the trusses down to the walls, especially in buildings which are partially open, and where the wind may get below the roof, and exert a lifting action.

It has been a very common practice to assume the steady load as 40 pounds per square foot of roof, including truss. The better method is to compute the various items separately, and then add to their total the approximate weight of the truss itself. After a truss is roughly designed its weight should be calculated to see how well it agrees with the estimated weight. If the agreement is not sufficiently exact, the proper allowance must then be made.

Trautwine says that for spans not exceeding about 75 feet and trusses 7 feet apart, the total load per square foot, including the truss itself, purlins, &c., complete may be taken as follows :

	Lbs.
Roof covered with corrugated iron, unboarded.	8
Same if plastered below rafters	18
Roof covered with corrugated iron on boards	11
Same if plastered below rafters	21
Roof covered with slate unboarded on laths	13
Same on boards ¼-inch thick	16
Same if plastered below rafters	26
Roof covered with shingles on laths	10

For spans from 75 to 150 feet it will suffice to add 4 pounds to each of these totals.

The weight of an ordinary lathed and plastered ceiling is about 10 pounds per square foot, and that of an ordinary floor of 1¼-inch boards, together with the usual 3x12-inch joists, 15 inches apart from center to center, is from 10 to 12 pounds per square foot. White pine timber, if dry, weighs about 25 pounds ; Northern yellow pine, 35 pounds ; Southern yellow pine, 45 pounds, and oak, 50 pounds per cubic foot ; if green or wet add to these weights from 20 to 50 per cent. Cast-iron weighs 450 pounds and wrought iron, 480 pounds per cubic foot. The allowance for snow will have to vary with the latitude. Snow saturated with water will mostly slide off from roofs of ordinary pitch. An allowance of from 12 to 15 pounds per square foot of roof will suffice for most latitudes.

We have now presented the theory of strains, with illustrations of the methods of calculating them. Many of our readers have followed the subject carefully, and some of them have made practical tests of the suggestions offered. Some have reached results altogether correct and satisfactory, while others are in doubt as to the conclusions shown by their calculations. In order to impress this subject more firmly upon the minds of those to whom it is of great importance, we suggest a test competition. We propose that our readers shall make strain-sheets of a given truss and send them to us for examination and criticism. If our elucidation of principles has been so clear as to enable all competitors to send in correct diagrams, we shall take pleasure in announcing such a result. On the other hand, if our meaning in any particular has been misapprehended, this plan will enable us to give still further instructions, with a knowledge of just what points are at present obscure. Accordingly, we trust our readers generally will co-operate in this matter.

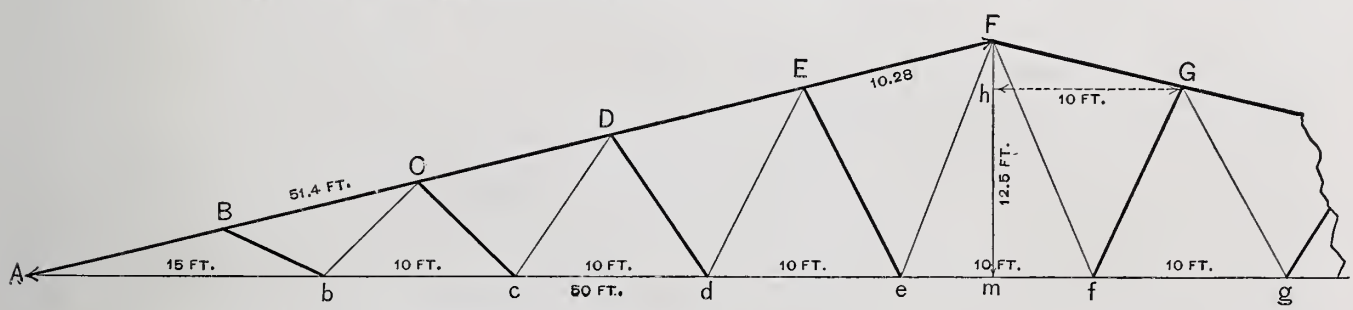


Fig. 23.—Problem : Find Strains in Roof Truss A F G, g under Steady Load and Wind Action from the Left. Length of Span 100 Feet. Length of Rafters 51.4 Feet. Hight of Roof F m = 12.5 Feet. Horizontal Panel Length h G = 10 Feet. Rafters to be 20 Feet Apart from Center to Center. Total Steady Load 50 Tons, or One-half Ton per Foot of Span.

Fig. 23 represents the form of a roof truss for which we should like to get strain sheets from our readers. The total span of the truss is 100 feet. Hight of truss in center 12½ feet ; the total load 50 tons, the trusses to be 20 feet apart. Strain diagrams, to be noticed by us, must be on a scale of 1000 pounds to an inch ; the diagram of the truss to be drawn to a scale of 10 feet to an inch. The normal wind pressure is to be determined by our table of wind pressure.

The three diagrams, namely, diagram of truss, strain diagram for steady load, and strain diagram for wind pressures, must all be drawn on a single sheet of paper. The tabulated strains on the different parts of the truss may be placed on the strain-sheet, or sent in on another sheet of paper. Address all communications to Editor *Carpentry and Building*, 83 Reade street, New York, and accompany them with full name and address of senders, so that answers by mail may be sent if found necessary.

A very large demand exists in this country at the present time for wild cherry. In supplying the place of walnut, cherry has become quite valuable. An exchange suggests that good care should be taken of the growing trees. This wood is used very extensively in making ebonized furniture. Its grain is close. It takes a stain very nicely and is capable of a high polish. Besides the demand for it in furniture-making, wild cherry is used largely in the external fittings of railway cars, and also as a finishing wood in public and private buildings.

We would not advise amateurs to attempt to hang a sash.—It would be better to secure the services of a competent hangman.

CORRESPONDENCE.

A very large proportion of our space this month is occupied by the Specification Competition. While this is uudoubtedly very interesting aud useful matter for our readers generally, it deprives our pages of some of their wonted brightness in the way of pictures. The benefit that our readers are expected to derive from this competition lies in the comparison of one effort with another. Accordingly, in putting the decision of this competition into the hauds of our readers, and requesting a vote, we accomplish two puiposes. We afford a definite reason for careful reading and comparison, and at the same time are enabled to award the prizes to the authors of the most popular specifications. We trust our readers generally will co-operate in this scheme, and that they will send their ballots forward according to the terms mentioned in another column.

In the article on Strains in Roof Trusses in another portion of this issue, we propose to our readers some experimental strain sheets to be seut to us for examination and criticism. This propositiou we believe to be of special interest to our readers, and we trust that a number of them will act upon our suggestion. Our object in makiug this proposition is to ascertaiu definitely the success that we have met in expounding the principles underlying this important branch of construction and design.

Portable Tool Box.

From A. W. E., *Liberty, Mo.*—In answer to the inquiries about a better device for carrying tools than in a box, the best thing that I know of is an ordinary tool bag. It is made of a kind of rush, and is bound to protect the edges. It is lined with canvas, and has pockets for nails and small tools. Articles of this kind are made in different sizes. By taking hold of the handles it is in a shape to be quite handy to carry. I understand that articles of this kind are in use in some sections of the country, but I have not seen any since I left England.

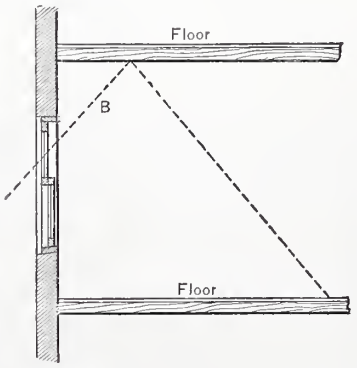
Resharpening a Diamond.

From G. M. W., *West Valley, N. Y.*—Can a diamond used for cutting glass be resharpened? If so, where can I get it done? I have a very nice stone, but long usage has made it dull.

Answer.—The recutting of a diamond depends somewhat upon its size and general condition. If the stone be a first-class article, we have no doubt that our correspondeut can get it recut as he desires. His best plan will be to communicate with some firm of diamond cutters by the medium of a reputable jeweler.

The Arrangement of Windows in Factories.

From F. H. R., *Springfield, Mass.*—The construction and arrangement of windows in factories to most effectively light the interior is of such importance as to merit the most careful attention of builders and owners. Probably no feature affects the exterior of buildings less and their efficiency more than this one item of windows. To throw the light well into the center of rooms the windows should extend from a sill of the usual hight clear up to the floor above. The angle of deflection is then greater and strikes further back, as shown in the inclosed sketch. The window shown at the left is placed high in the room, while one as very commonly located is shown at the right. The dotted lines illustrate the difference in the efficiency of the two openings in the way of lighting the room.



Arrangement of Windows in Factories.—Fig. 1.—A Plan Frequently Employed.

Framing a Church Roof.

From G. P. Randall, *Chicago, Ill.*—Inclosed herewith I send you a design for a church roof of narrow span, say 34 feet width of building, to meet the requirements

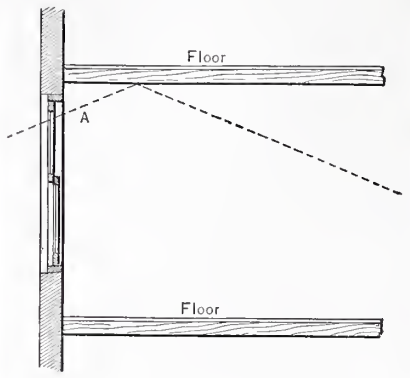


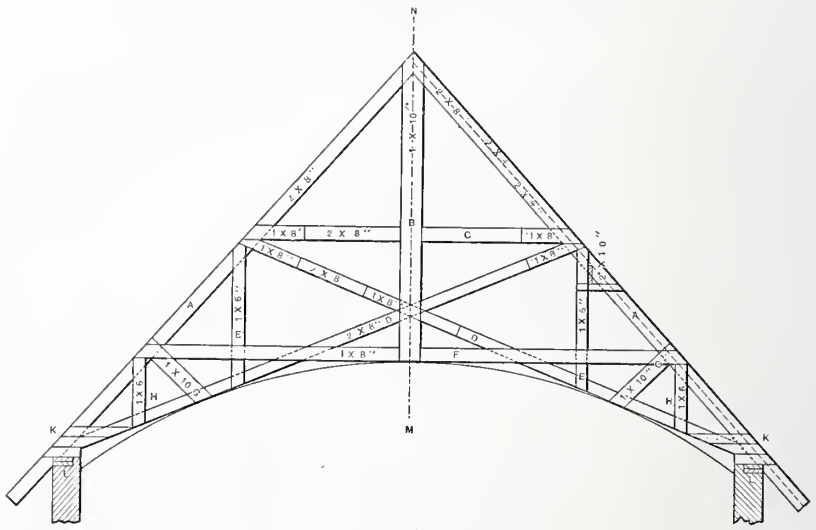
Fig. 2.—A Better Plan for Lighting the Shop.

of a communication from T. P., of Franklin, N. C., in the August number, page 140.

This kind of a roof or others similar in principle are often used, and I might almost say as often fail, generally because those who design them do not seem to understand the direction and character of the strains on the several parts. The sketch of T. P., in the August number, is not well constructed, mainly because he omits at least one important piece of timber—the straining-beam marked C in my design—the strain on which is one of compression. If the feet of the ties D D tend to thrust outward, these pieces will have a strain of tension or pull in the direction of their length, which without this straining-beam, C, would at once pull the middle of the rafters down, and at the same time thrust the walls out. In practice I always endeavor to get the tie F in as low down as practicable, and if it is a large church with timbered ceiling, let this tie appear in the apparent timbering of the ceiling. The want or omission of such a tie has brought many an architect and constructor to grief, and I have seen with my owu eyes a church in your city in process of construction with cable ropes across from wall to wall, through each pair of windows, with a twister in the middle by which these ropes were tightened to prevent the badly-constructed roof from overturning the walls, aud that too in a church that cost some $200,000 to $300,000. So much for bad construction.

Now to our diagram. The principle of this roof is two sets of timbers put together in a triangular form, either of the two sets forming a triangular truss of themselves, and when joined at the central line M N forms what we may call a roof truss. Remove all above the timber C, and it would still be a roof truss, though largely reduced in strength. As it stands, with all the parts adjusted to their places, A A are rafters, and, in this case, 2 by 8 inches, running the whole length of the slope of the roof. D D we will call inclined ties, one of which runs from the wall plate, where it connects with the rafter A, across and abuts against the under side of the opposite rafter A, and is connected to and with this last-named rafter by spiking a short piece of board on each side of the rafter A and the end of the inclined tie D. The other inclined tie will be similarly constructed or framed, except it will be cut in two at its crossing with its mate, and the two pieces of this tie will be connected together and with their mate by spiking a 1 x 8 inch board on either side and to the mates. This, if well done, will make both of these inclined ties as one piece and fast at the crossing of the two. The collar beam C, or in this case it may very properly be called a straining-beam, is 2 x 8, cuts off at the under side of the rafters, A A, and is held to them by the usual boards nailed to each piece.

The foot of the rafters and inclined ties are thoroughly connected by nailing several boards on each side. In this case I have indicated three of them, but if I wanted to make it very strong I would board it all the way up to the horizontal tie F on one side and vertically on the other side to E. The ties F on each side of the other timbers and connecting boards are important where other things will admit of their being put on, but it is a very good truss without these ties. It is well, in this construction, to put a short block, 2 by 8 inches, between the boards F, to which the suspending board B may be nailed, as well as the ties F. The braces C, E and H show their place in the composition and need no further explanation.



Framing a Church Roof.

O shows the end of a purlin, 2 by 8, or 2 by 10 inches, on which, in this particular case, intermediate small rafters, say 2 by 4 inch scantlings. may rest in the middle, on the wall plates at the lower end, and against a board or plank purlin at the ridge. These purlins are supported by a short piece of board across the rafter and adjacent vertical brace E.

In conclusion I may say that this truss is intended to sit about 8 or 10 feet from its fellows, with intermediate small rafters, 2 by 4 inches, resting on the purlins as described. If to cover a very important edifice, or one in a climate where it is liable to be covered with snow, it would be prudent to put these nearer together, or say 6 feet, with only one intermediate small rafter, or more or less as the case may be. I have generally used them in this shape, but a trifle lighter in construction, aud set them about 2 feet to centers, without intermediate small rafters, but for this span it will be safe to set them 6 to 8 feet apart, but T. P.,

and every one else who uses this kind of a truss, must keep in mind that it is to be built of sound and dry timber, and spiked without stint. As a general rule builders are apt to be stingy of their nails and spikes. Such a construction, well put together, will give the builder no uneasiness when he ought to sleep soundly at night, but in the various places where it may be used with safety it requires good judgment to determine its various parts. The writer has used trusses of like character in the last 30 to 35 years with excellent satisfaction to himself, and without the mortification of seeing one fail, and I have built them to a span of some 75 to 80 feet, and without the tie F in the composition. Of course, trusses so large and with so great a span require larger timber and more of it; but for a roof of 30 to 40 feet span, I have never seen a truss that answered the requirements of good construction better than this one does.

I fully indorse everything contained in your note appended to the inquiries of T. P., in the August number. I should never give a ceiling of a public hall or church that form.

Cabinetmaker's Bench.

From A. H., *Fayetteville, Ark.*—In the May number of *Carpentry and Building* A. H. G., Halifax, requested some reader to furnish a sketch of a cabinetmaker's bench.

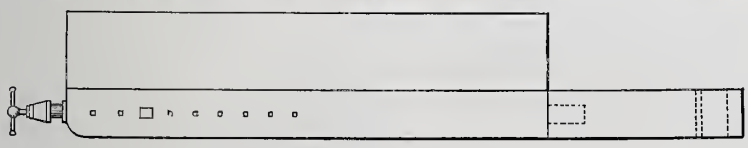


Fig. 1.—Top View.

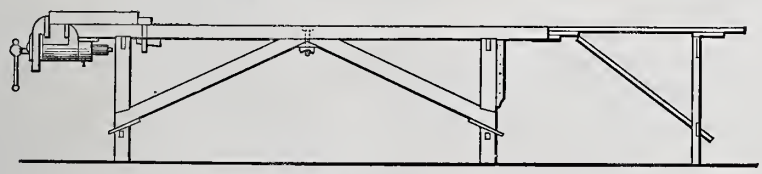


Fig. 2.—Side Elevation.

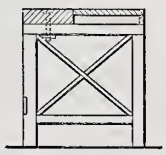


Fig. 3.—End Elevation.

Cabinetmaker's Bench Contributed by A. H.

I herewith send a rough drawing of my portable bench, on which I use the vise patented by me, an illustrated description of which appeared in the August number of *Carpentry and Building*. Fig. 1 is a top view, and Fig. 2 is a side view of the bench, showing the vise on the end for tail screw purposes. The tail frame extension is made of from 2½ by 1¼-inch stuff. Various details of construction are also shown in the sketches. The top is gained ¼ inch for legs. A 1½-inch key-plate is used in each frame. A smaller key-plate is used through the top and block for holding braces. Wood keys are used for foot of braces. The extensions, legs and braces are hinged as shown, and are furnished with an iron clasp to bench and key. The carpenter shop should be arranged in width according to the work to be done, and benches should stand north and south, and the windows in the shop should be on the north and south sides. There should be no lights in either the east or west sides. I offer these opinions in the light of an experience of over 45 years. For saw filing the north light should be the only one in the room in which the work is done.

Ventilating Chimneys.

From A. M. B., *South Canaan, Conn.*—I desire to inquire if chimneys are ever built double for the purpose of ventilation? Can you give me any information about chimneys in which an outer flue of brick is built for ventilation, within which one of cast iron is placed for the smoke? I would like to have particulars concerning this construction.

Answer.—The form of chimney suggested by our correspondent in the letter above is one very common in numerous public and private buildings throughout the country. A large flue is built for ventilating purposes, with which the several rooms in the building are made to communicate by proper means. Within the large flue a cast-iron or sheet-iron stack is placed, the lower end of which is connected the heating apparatus of the building. The theory of this construction is that the smoke, ascending through the iron flue, serves to warm the body of the air in the shaft in such a way as to cause an upward movement, thus producing ventilation in a very satisfactory manner. In many cases iron flues constructed in this manner are provided at the bottom with a small stove, in which a fire is kept during those seasons of the year when the regular heating apparatus of the building is not employed. By this means ventilation is maintained at all times.

Policy of the Paper.

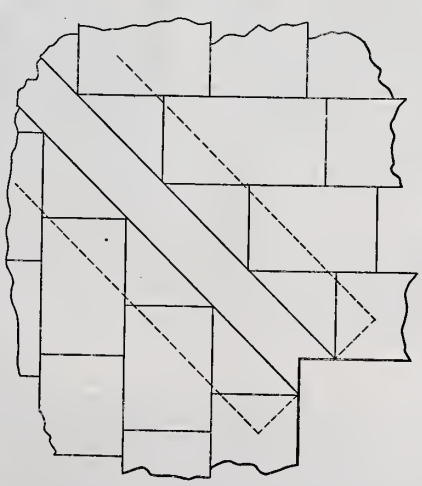
From G. K. C., *Jamesville, Wis.*—I am disposed to agree with A. W. W., of Toronto. I was pleased with his letter. Why some of the correspondents persist in asking questions that a boy 8 years of age ought to be able to answer, is difficult to explain. I presume they want to get to the top of the ladder without climbing it. The country is full of such men. It seems to me that they desire to steal up, instead of working their way up.

From R. R. T., *Sterling, Kan.*—I desire to thank E. C. B., of Winstead, Conn., for his able defense of the policy of the paper.

From H. M. N., *West Bend, Tenn.*—Let me record my vote in favor of the present policy of the paper. A wise man said many centuries ago something about the wisdom of a multitude of councilors. That is as true to-day as when uttered. To me the correspondence is very interesting indeed, and I should regret very much to see it discontinued.

Tin for Valleys.

From D. M. W., *Caledonia.*—I submit herewith a plan for employing tin in valleys, called out by the letter from C. H. H., published in the July number of *Carpentry and Building*. I have employed this method of shingling valleys for the last nine years, and have found it quite satisfactory. After the tin is tacked in place in the valley, I lay a strip of board across it 1 inch thick, 3 inches wide at the top and 4 inches at the bottom. I then pick out wide shingles, and saw them so that they fit to the strip. I nail the shingles in such a manner that the nails go through the tin at the upper edge, as shown in the sketch.



Tin for Valleys.

Filtering Materials.

From G. A. H., *Boltonville.*—Please tell me what are the materials used in water filters, that is, how many kinds of material are used inside these filters?

Answer.—Usually only two materials are found inside of filters; a finer one at the point where the water enters, and then coarser materials, alternating with fine, down to the point of discharge. Sometimes sand and gravel are the two substances used for filtering purposes. In such cases we often have the gravel packed at the bottom and the sides, gradually diminishing until the layer of sand finishes the filter at the top. Some English filters consist of a solid plate of carbon of a size sufficient to fill the filtering vessel, and of any depth, from a few inches, in small sizes, to 18 or 20 inches in the larger ones. There are several filters made in which charcoal is the substance used for purifying the water. How the course of fine sand and gravel are placed depends somewhat upon the way the water is carried through the filter. If it goes directly downward the fine is, as we have stated, placed on top, the coarser at the bottom. In some filters the course of the water is down on one side and up on the other. This of course necessitates a different disposition of the materials. In the great filter beds, where thousands of gallons of water are purified every day, sand and gravel are used, placed in layers, and the whole is topped off by a few inches of fine sand, which takes the bulk of the dirt. This sand can be frequently removed and replaced by that which is clean. The beds below this point are used to catch the impurities which get through the sand and prevent the sand from being washed directly into the discharge pipes. Tightly packed sponges are sometimes used for filtration, but they are not durable. The fresh water soon converts them into a jelly-like mass, and they have to be taken out. After washing and drying they may be used for a time, but their whole life is comparatively short.

Repairing Old Walls.

From G. J. S., *Taunton, Mass.*—The best putty with which I am acquainted for repairing broken walls is composed of equal parts of whiting and plaster of paris. As it hardens very quickly, the walls may be immediately colored after it has been applied. Some painters use whiting and size for this purpose, but in my estimation it is not as good, since it rises above the surface of the wall and shows a patch where the repairing has been done. Lime should not be used in repairing walls, since it will destroy almost every color with which it comes in contact.

Pitch of Saw Teeth.

From A. A. F., *Cleveland, Ohio.*—In answer to the inquiry of J. B. F., made in *Carpentry and Building* some little time since, I will say that by applying the protractor I find that the front edges of the teeth of my saws stand about straight up, or, in other words, at right angles with the line of the points. The line of the back edges stands at an angle of about 45° forward. I find by trying a new Disston saw that they are made to stand back about 12° or 13° of a right angle for the front side or edge. I find by that that I generally get them about 12° more hooking, as it is generally called, than Disston does. I think the pitch of the teeth should be made with reference to the kind of wood that the saw is to work. In soft wood the teeth may be pitched more forward than

for hard wood. Still, if too much pitch is given the saw for soft wood, the teeth catch too hard and are likely to jump when they strike a knurl of knot. If pitched pretty well forward, they will cut fast but will run a little harder also. Mechanics will not all agree upon this point. Some will want more pitch, others less. For myself, I do not so much desire a fast cutting saw as one that will cut nice and steady and at the same time smoothly. I want one that will follow a knife line from end to end perfectly. So far I have referred only to cross-cut saws.

REFERRED TO OUR READERS.

Brick Machinery.

From McV. & S., *Wetmore, Kan.*—We take the liberty of asking a few questions through your much appreciated paper. We made some brick this year, and are going more extensively into the business next spring. Before that time, however, we desire to find out all we can about brick making, and would like some of the go-ahead and intelligent brickmakers who read *Carpentry and Building* to answer the following questions through its columns: Which is the machine best adapted to the wants of a small yard that makes from 100,000 to 200,000 brick per season? If the same should be run by horse-power, state how many horses it takes to run the machine, the number of men required and the capacity of the machine per day. We also desire to learn of some cheap machine or contrivance which can be used by hand for pressing brick on a small scale. We have heard of presses, but cannot find out what they are like or where hey are made. In this connection we would like to know how many bricks can be pressed per day, and how many hands it requires to operate the machine.

Saw Filing.

From J. F. H., *Shipenville, Pa.*—The articles by A. A. F. on saw filing have come nearer to my ideal than anything I have ever seen in print. I am well pleased with the articles in general, but would like to know something more about the whys and wherefores. In one of the papers this correspondent advises commencing to file at the point of the saw. I would like to have it explained whether the point of the file is to be turned toward the point of the saw or toward the heel. Some mechanics file in one way and others by the other plan. Should the hand be lowered below the level of the saw? I trust A. A. F. will go forward with his articles on saw filing until he has covered all the different hand saws in use.

Octagon Bay Window.

From H. M. N., *West Bend, Tenn.*—Will some practical reader please give me directions for laying off the ground plan of an octogan bay window. How far should the square part project from the wall of the house? How wide should a window be opening from a 16-foot room? I want all necessary directions for getting the angles for any size room. These may be very simple question, but I think an answer will benefit others besides myself.

Hay Press.

From F. A. W., *Kibesilla, Cal.*—Will some subscriber send in a plan for a cheap and easily made hay press? Many carpenters in this section are often called upon by farmers to do jobs of this description.

Finishing Turned Work.

From E. P. M., *Greenwood, Ohio.*—I would like to request through the correspondence department of the paper, wood-turners to contribute their stock of information on finishing work in the lathe, preparing the material for polishing and filling, together with the different processes of shellacing, varnishing, and particularly for the different enamels or hard finishes in various colors used for small goods.

Concrete Partitions.

From H. P. C., *West Granville, Ohio.*—How would concrete do for partitions to a stone house where they are required to be 18 feet in hight? How thick should they be?

Strength of a Pine Joist.

From C. R. S., *Caldwell's Prairie, Wis.*—Supposing a joist 2 x 12 inches in section, placed 16 feet between bearings, being of white pine, free from defects, is cut down, where it rests upon the wall, to a depth of 9 inches, as shown in my sketch, what weight placed upon it will cause it to split or break on a line similar to A B of the drawing? In other words, is the strength of the stick diminished by cutting out the 3 inch relish at the bottom?

Strength of a Pine Joist.

Cutting Square Holes.

From W. H. R., *Ogden City.*—I have a question which I desire to propose to the readers of the paper. Can a round bit be made to cut a square hole, or, in other words, a mortise, cutting once only. If not, why not—and if so, how?

Grocers' Refrigerator.

From S. H. C., *London, Ont.*—Will some reader of *Carpentry and Building* publish a plan and specification of a butter cooler and refrigerator large enough for a retail grocery, the cost to be from $75 to $100?

Finish of a Bathroom.

From M. H. M., *Haverhill, Mass.*—Will experienced readers of the paper furnish plans, detail and specification for the finish of a bathroom in good style, but not expensively equipped?

Joining Roofs of Different Pitches.

From B., *Camden, Ohio.*—I am at a loss to understand how D. H. J. would join a main and wing planceers with his plates as shown in the sketch published in a recent number. Perhaps he can explain this point for my benefit and that of others who are interested in the subject.

Slaughter House.

From J. C. R., *Carthage, Ohio.*—I desire to ask of the readers if some of them can give me a plan for a two-story frame slaughter-house about 30 x 40 feet in size, arranged for an upright steam boiler and a rendering tank. I also desire to know something about the interior finish of such a building.

Farm Cottage.

From J. L. F., *Milan, Ohio.*—Mechanics living in the country towns would be greatly interested in the elevations, plans and details of a small farm cottage, costing from $600 to $1200. A subject of this kind would be of much more interest to us than some of the topics proposed by A. W. W. in his recent letter.

Questions Relating to Brickwork.

From H. L., *Lewiston, Me.*—Practical bricklaying has not received as much attention at the hands of the correspondents of *Carpentry and Building* as its importance would seem to demand. Accordingly I desire to propose a few questions. Will some practical reader tell us how to set steam boilers in brickwork, how to build steam chimneys, the best mortar to use in the same, whether all lime or all cement, or a mixture of the two, and what proportion of sand? Which is better for brickwork, fine or coarse sand? How large should end joints be in cut brickwork?

STRAY CHIPS.

A CORRESPONDENT in Ciacinnati states that in the city proper the old two and three story buildings, which heretofore have been a prominent feature of that city, are at present giving way to substantial five and six story structures. Blocks of French flats have been erected in various parts of the city and have been found to pay a high rate of interest. Accordingly capital is being freely put into them. During the past year a considerable number of private dwellings have been erected in the suburbs of the city, and a number of large buildings have been put up in the city proper. Among these may be mentioned the following: Messrs. Brooks, Waterfield & Co. have put up a tobacco warehouse, 152 x 172 feet, costing $50 000. A five-story warehouse has been erected for the Singer Sewing Machine Company at a cost of $16,000. A four-story brick carriage factory has been put up for Messrs. Geo. Enger & Co., at a cost of $30,000. Messrs. G. & H. Mühlhauser have erected a five story building for stores, offices and flats, 50 x 90 feet in size, costing $40,000.

BUILDING OPERATIONS in St. Louis were never more active than at present. Considerable work which was contemplated in the spring and was deferred with the expectation of a fall in prices, is now being thrown on the market in the hope of completion before winter, although prices are higher now than in the spring. Bricks have advanced $1 a thousand; plumbers' and plasterers' wages are 50 cents a day higher; lumber is on the rise, and in many other ways the cost of building has appreciated 10 to 15 per cent. In some directions, also, the demand for material exceeds the capacity for supply. The brickyards are said to have sold several million bricks in advance of their stock now on hand. Foundations remain partly finished because the quarries cannot furnish building rock fast enough. Cut stone contractors complain of want of material, and planing mills generally are from one to three weeks or a month behind on their orders.

THERE SEEMS to be almost an unlimited field in St. Louis for mechanics of all kinds, and for planing mills, foundries and all other establishments which are concerned in supplying building material.

THE NEW Cincinnati Custom House is progressing slowly. The iron rafters, cresting for the roofs and towers, &c., are all in position and the roofs are ready for slating. The commissioners have awarded to Wm. Miller, of Cincinnati, the contract for elevators and elevator towers.

THE GROOM SHOVEL COMPANY are erecting extensive works in St. Louis for the manufacture of shovels by the Groom patent process. One building alone is 50 feet wide by 300 feet long, and others in proportion.

WORK HAS BEEN LET for the foundation of the Union Depot, to be erected at the corner of Pearl street and Central avenue, Cincinnati. W. W. Boynton, of Chicago, is the architect; and W. P. Thorp, the local superintendent.

THE ST. LOUIS AND IRON MOUNTAIN RAILWAY COMPANY has just completed a new passenger station at the corner of Chouteau avenue and Fourth street, St. Louis, for the convenience of its local passenger traffic. All trains except through express trains will arrive at and depart from the new depot.

THEODORE A. RICHTER, JR., of Cincinnati has recently finished plans for an eight-room frame house, to be built at Kennedy, Ohio, for Mr. A. R. Robinson, at an estimated cost of $8000. The same architect has also prepared the plans for a six-room frame house, to be built at Price Hill, for Mr. W. W. Kelsall, to cost $5000.

ON THE EVENING of September 8th the immense broom and woodenware factory of Samuel Cupples & Co., at St. Louis, was completely destroyed by fire, together with several adjoining buildings. Cause of fire not yet known. Loss partly covered by insurance. The company will probably rebuild at once.

A WEALTHY but illiterate man, who was advised by his arcbitect to build his suburban residence in the Tudor style, replied, "I don't want two doors. One door will do for me; my family is small, and there'll be the less to lock up."

THE EAU CLAIRE, Wis., *News* has the following: "Buildings on the right of us, buildings to the left of us, hammers volley and thunder. No one has time to count, but there are surely 600. Oh! when shall our glory fade, or this enterprise be stayed? Not until the youngest babe has seen years a hundred."

THE ANNUAL CONVENTION of the American Institute of Architects will be held this year at the Gibson House, Cincinnati, commencing October 25. Special arrangements have been made for the accommodation of members and others present.

CARPENTRY AND BUILDING

A MONTHLY JOURNAL.

VOLUME IV. NEW YORK=NOVEMBER, 1882. NUMBER 11

Increasing Use of Gum Wood.

A Chicago sash, door and blind manufacturer has gone somewhat extensively into the handling of gum, and manufacturers' moldings, base-boards and other finishing materials from that wood. He has worked up some eight car loads of gum this season, and finds that the further south the wood grows the better it is, and the more readily handled. It is true of all woods that further south they become of enhanced hardness and density, and of better quality. The texture of gum which grows in Mississippi is much finer than that of the wood growing further north, and some of the Illinois gum is very coarse. The gentleman referred to has been experimenting with gum some five years, and having great confidence in it, he has been giving the wood a larger share of attention this season than during previous years. There are a number of establishments in Chicago which are using gum more or less extensively as a finishing wood, and are advancing it step by step, though there has been no method found to overcome its warping characteristics where it is employed in large surfaces. Wherever it can be nailed thoroughly, it is the experience of operators that it can be controlled, but where it cannot be confined it is certain to warp. Architraves or pilasters are a favorite form into which it is made, and when oiled, or treated to a polish, there is no finer finish, and those building elegant houses are said to prefer it in very many cases. It is not only cheaper than clear pine, but it is worked up, if anything, more easily, and presents even a smoother, nicer surface when finished, while the readiness with which it is given a fine polish is not exceeded by any other kind of wood.

A new plan to deaden floors has recently been patented, which appears to be quite desirable. A 6 x 3 plank is inserted between each joist, 2 inches from the bottom of the joists, and projecting 4 inches beneath. Ceiling boards are nailed underneath the intervening planks, and the space is filled with sawdust to within 1 inch of the joists. It is said that by this method the sound waves are carried off, and that the most vigorous hammering cannot be heard in the story beneath.

Third Prize Design in Elevations and Details of the Eight-Room House.

Our engravings this month are made from drawings contributed by Mr. B. C. Pond, Auburndale, Mass., to our sixth competion, and to which was awarded the third prize. The author, in submitting this effort, gave very little description of his plans or the reasons which led him to the adoption of the features which he has embodied in them. He said his design was made with the intention of conforming to the floor plan that was the basis of the competition, in all particulars, but that had a different arrangement of windows, chimneys, piazza posts, roof, &c., been employed, he believes a better effect could have been produced. The only intimation of the specification of the construction of this building given by him was contained in the following words: "The exterior walls of the first story are to be of red shingles, oiled. The second story is to be clapboarded and painted 'stone yellow,' with bottle-green trimmings. The roofs are to be convered with cedar shingles dipped in Venetian red. Culled common brick laid with

Third Prize Design in the Sixth Competition.—Fig. 1.—Perspective View.—B. C. Pond, Auburndale, Mass., Architect.

red mortar is intended to be used for trimmings, &c. The interior finish of the first story is designed to be of pine and ash in the natural wood. Other parts to be finished in pine, painted." A comparison of the four sets of engravings which have now been published, all conforming to the one floor plan, forms an interesting study. Every one has a general idea that the same floor plan may be variously treated, but in no case that we now recall has it been so graphically illustrated as in the present instance. The efforts of four competent architects, each of whom has chosen a distinct character of treatment, have been published so that they may be laid side by side. A careful comparison in this manner can hardly fail to be both interesting and profitable.

Third Prize Design.—Fig. 2.—Side Elevation.—Scale, ⅛ Inch to the Foot.

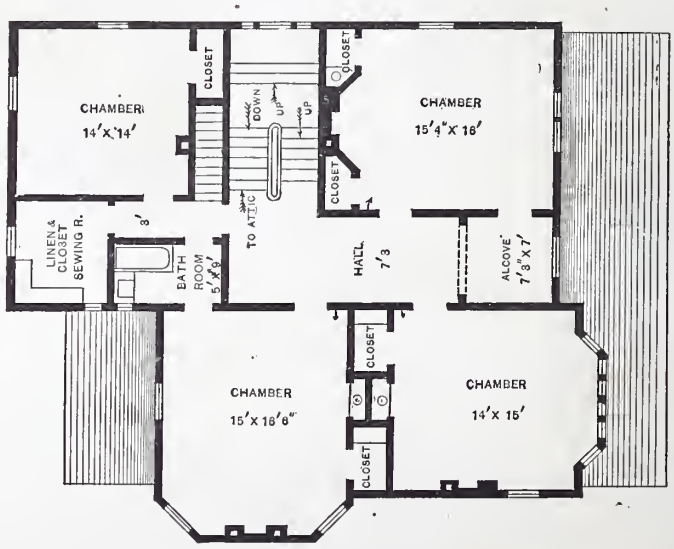


Fig. 3.—Second Floor Plan.—Scale, 1-16 Inch to the Foot.

NOTES AND COMMENTS.

The capitol building at Albany has been the subject of discussion in both architectural and political papers for a long term of years. The large amount of money expended in the construction of this building, and the fact that its plans were changed after a portion of the work had been done, in order to reduce cost, are circumstances known to almost every reader of the paper. Some time since the building was occupied for the purposes for which it was intended, and immediately thereafter rumors began to be circulated that the building was unsafe, and that certain portions of it were in actual danger of tumbling down. Accordingly, the Governor appointed a special commission to examine in the architectural profession, were appointed to this work, and, under date of September 26, rendered their report. The report is too voluminous to be even adequately summarized in this connection, but in a few words we can point out some of its features. It states that as the result of careful investigation, made with the assistance of the local superintendent of the building and the architect in charge of the work in its latter stages, they discover no defects worthy of special consideration, except those in the assembly chamber, and the portions of the building immediately above and below it. In all other respects the material and workmanship of the building are exceptionally

good. After narrating the experiments made in order to determine the condition of the vaulted roof of the assembly chamber, and calculations entered into in order to determine its stability and safety, together with considerations of the foundations, they recommend that the stone vaulting be removed, and that its place be supplied with a groined ceiling constructed of wood. The report states that if the members of the commission could be assured that the unequal settlement of the foundations had permanently ceased, they would not consider this course necessary, but inasmuch as that question has not and cannot be determined, there seems to be no other course than that pointed out.

houses and home-club buildings, now becoming so popular. A home club may be described as an ordinary joint-stock company, limited. A certain amount of stock entitles the holder to a virtually perpetual lease of a certain apartment in the building, and for which these leases are transferable only to parties acceptable to other members of the

Third Prize Design.—Fig. 4.—Front Elevation.—Scale, ⅛ Inch to the Foot.

The present outlook in building matters in New York City is decidedly favorable to those engaged in all the various departments of the building trades. A spirit of content seems to pervade the various classes of mechanics. Fair wages is at present the rule, and from present indications there will be no lack of labor for builders, bricklayers, masons, plasterers, carpenters, hod-carriers, &c., for a long time to come. When it is remembered that there are over 30,000 men engaged in this industry in this city, and that they represent not less than 25,000 families, who are altogether or partially receiving their support from the same, the importance of the building interests of New York City can hardly be overestimated.

The total estimated cost of buildings for which plans have been filed with the Building Department of New York City since January 1, is upward of $35,000,000. Prominent among the classes embraced in this estimate may be mentioned the apartment

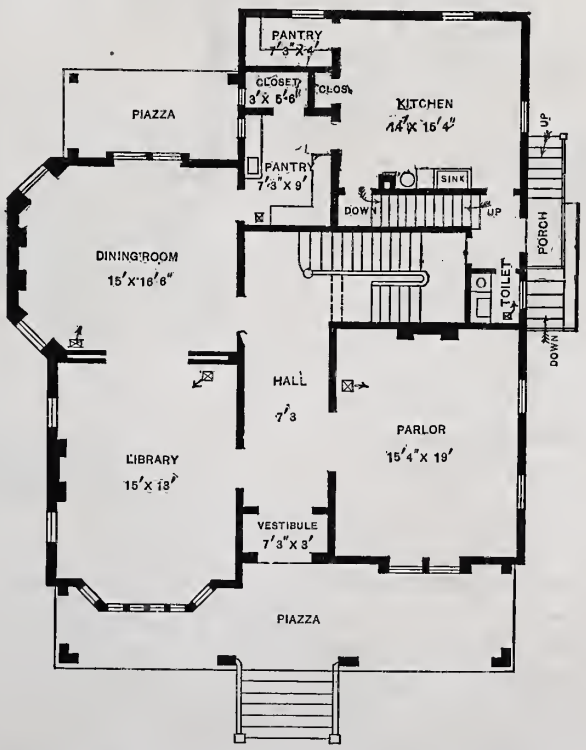


Fig. 5.—First Floor Plan.—Scale, 1-16 Inch to the Foot.

club. A very considerable number of apartment houses in the vicinity of Central Park, and in other desirable localities, are built upon this plan. Within the last three years

secure public favor a year since. The Manufacturers and Mechanics' Institute are holding a fair again the present year, and it has attracted a great deal of attention both upon

woods abounding in the sections through which their lines run. Some of these woods are well adapted for structural purposes. Others have the characteristics necessary

Third Prize Design.—Fig. 6.—Rear Elevation.—Scale, ⅛ Inch to the Foot.

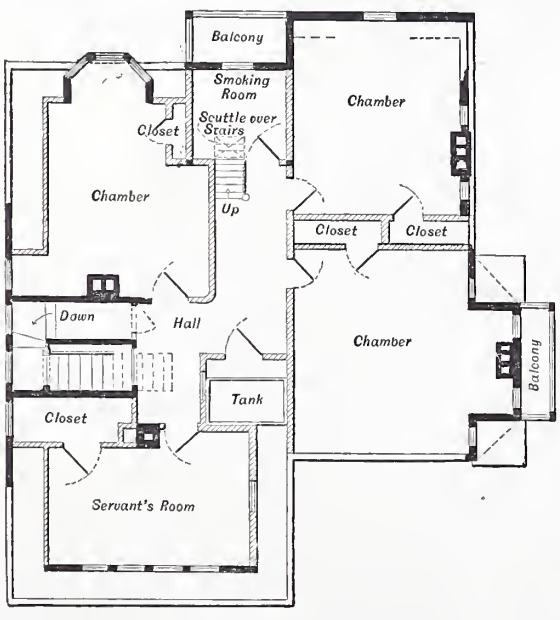


Fig. 7.—Attic Plan.—Scale, 1-16 Inch to the Foot.

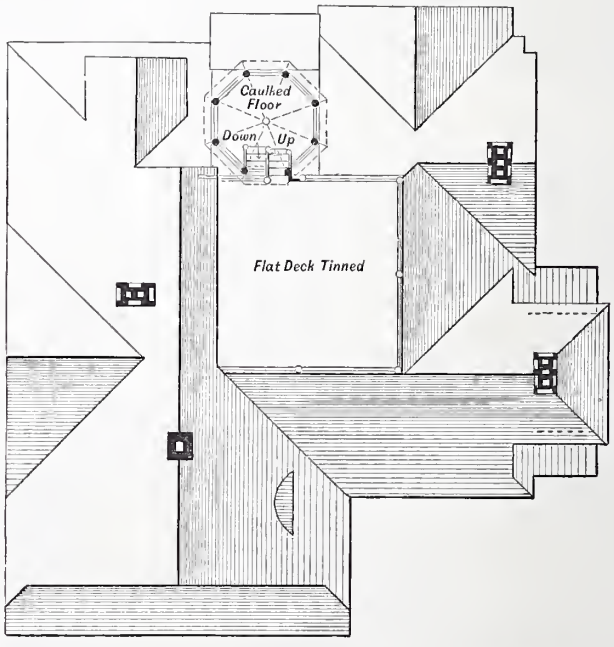


Fig. 8.—Roof Plan.—Scale, 1-16 Inch to the Foot.

$5,000,000 have been invested by home clubs in this city.

A year ago New England supported two industrial fairs. One was under the auspices of the Massachusetts Charitable Mechanics' Association, and the other the New England Manufacturers and Mechanics' Institute. The former is an institution whose history reaches back of the American revolution, while the latter made its first endeavor to

the part of mechanical papers and visitors. While there is comparatively little in the exhibition of direct interest to architects and builders, there are many things of indirect value to all interested in building matters. Among the latter may be mentioned some of the displays made by some of the Southern and Southwestern railroad companies. In order to advertise the lands through which their roads run, these companies have made extensive displays of specimens of the native

for fine finish. Builders who are so fortunate as to visit this exhibition cannot fail to be interested in these displays. The same companies exhibited the resources of their roads at the Atlanta Exposition last fall.

The resources of the Southern States in timbers and minerals, to say nothing of the sites for manufacturing establishments through various parts of the country, are matters with which the public at large are

not well acquainted. A glance at some of the resources of this section of country will not be without interest to the readers of this journal. The South furnishes pine for the masts of ships, ash for ores, cedar for racing boats, oak for planks and for ship's knees, and locust, yellow or black, for pins. In her forests are found white-oak and hickory for the spokes and rims of wheels, black-gum well suited for hubs, poplar or white-wood largely used for the bodies of vehicles, and ash and hickory for poles, shafts and cross-bars. All these woods are also used in the construction of railway cars. The North is already drawing on this section of the country for supplies of these woods. Factory stock for cotton and woolen mills, such as

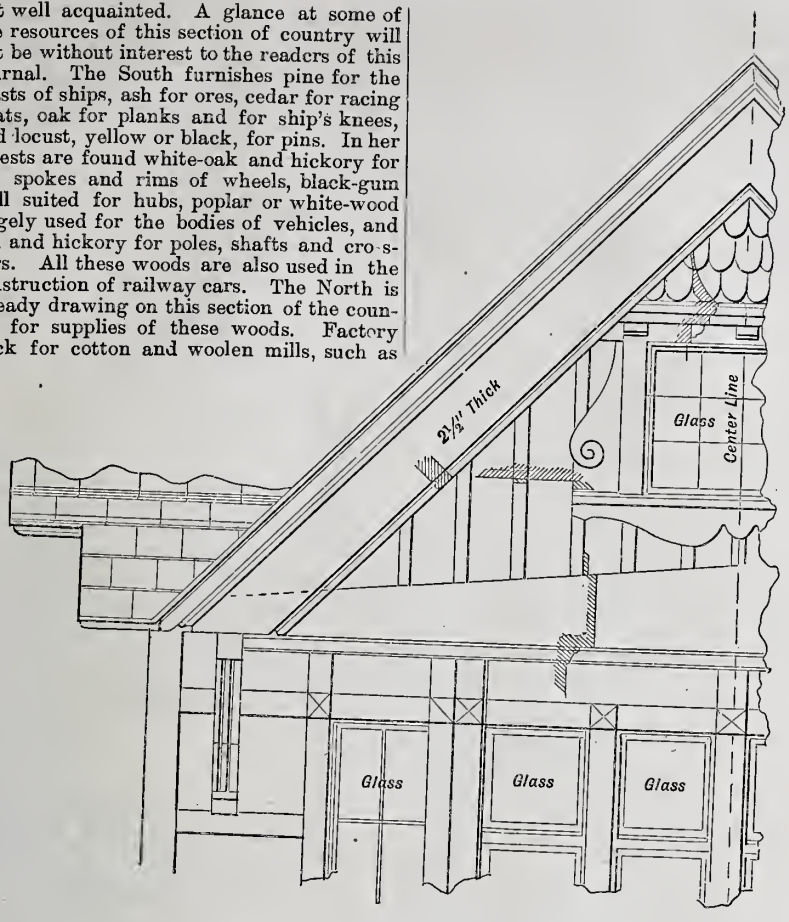


Fig. 9.—Detail of Gable Over Bay Window.—Scale, ⅜ Inch to the Foot.

shuttles, bobbins and spindles, is made of North Carolina dogwood, persimmon, sassafras and sour wood. The enormous use of hardwood in the manufacture of agricultural implements is pretty generally known also, the great consumption by the wooden ware, cooper, match, shoe-peg and other trades. Recent surveys of the resources of the Southern States show that every American wood used in commerce or in the various branches of industry can at present be found in the forests of that region, and in abundance.

One of the Western lumbering papers has been making some very caustic remarks in regard to those who prophesy the total destruction of the white-pine forests. To show the ridiculousness of predicting anything like their extinction, it points to the fact that there are now pine lands in some of the older States, as, for example, Maine, which have once been cut over and yet are now producing trees. It says: "We have as much pine now as we want, and that we always shall have." It also points to the older prophecies in regard to the extinction of pine, and reminds us that if these had come true we ought to be without that valuable timber at the present day. The reply to this is that we are practically without such pine as our fathers used. Money will not buy, in this market at least, pine boards and pine timber of a quality similar to that called first-class 50 or 60 years ago. That we shall always have a supply of pine timber is not to be

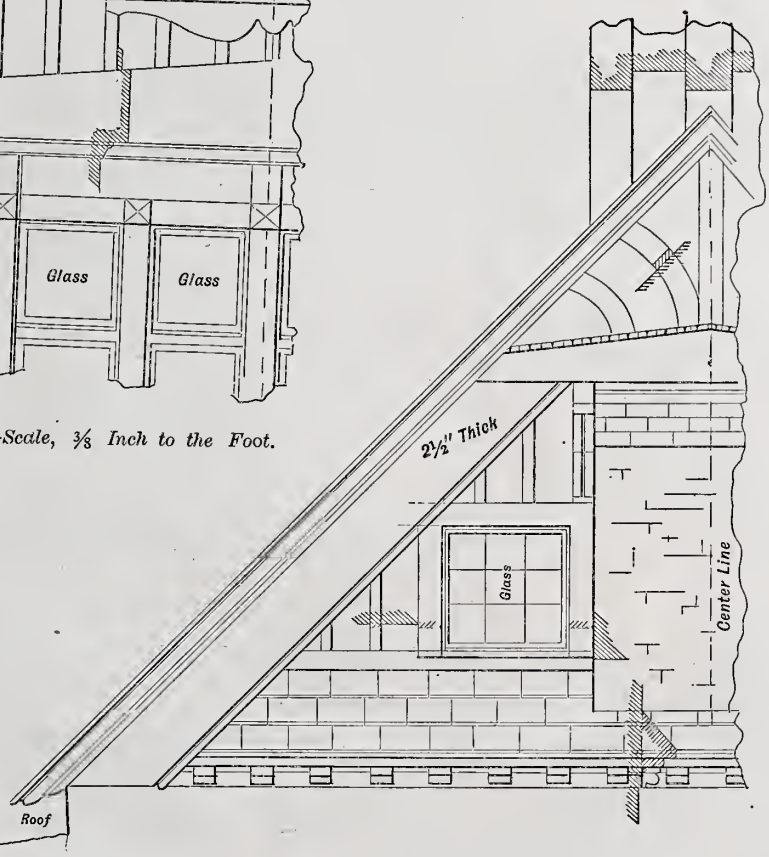


Fig. 11.—Detail of Side Gable shown in Fig. 2.—Scale, ⅜ Inch to the Foot.

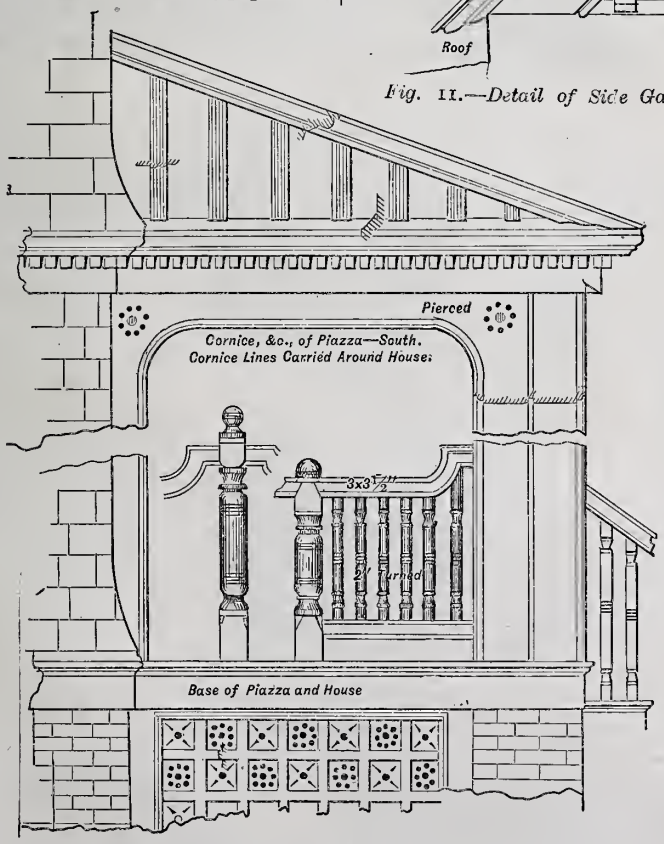


Fig. 10.—Details of Porch.—Scale, ⅜ Inch to the Foot.

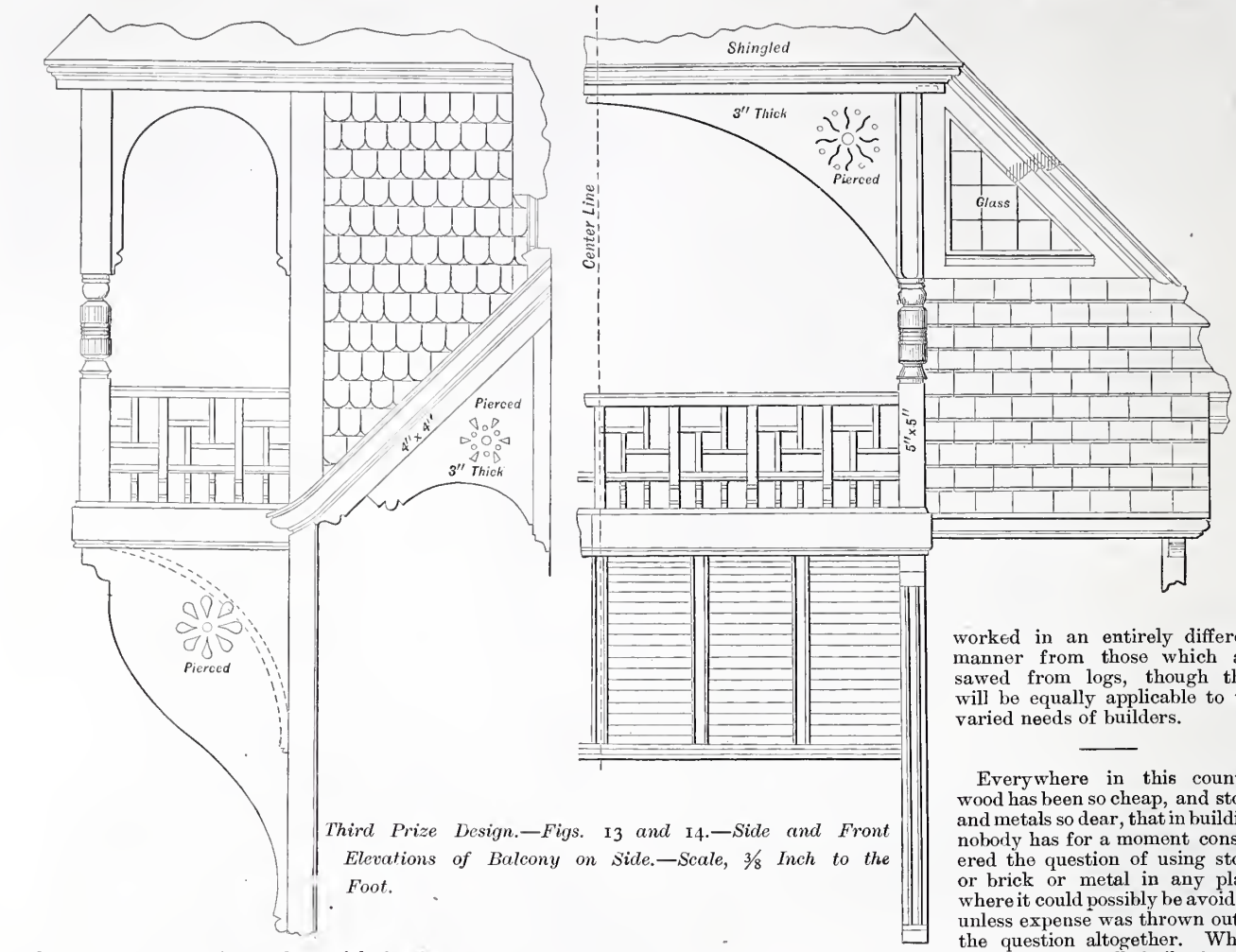
doubted, but the quality will be vastly different from what it has been in the past, and

Fig. 12.—Detail of Tablet on Side Elevation.—Scale, ⅜ Inch to the Foot.

the price, no doubt, will be greatly increased, while the supply will eventually be small.

The announcement is made by the authority of the Government Bureau that the white-

pine forests of the United States will, at the present rate of consumption, furnish less than 12 years' supply of that timber. This announcement has received in general very little attention. Few people indeed seem to understand what a depletion of white-pine timber means. The price of the article has enormously increased within the memory of men now living. To-day a first-class article, so-called, is quoted at perhaps $55 a thousand. Sixty or seventy years ago it was worth about $10 or $12 a thousand, and what was then called first-class cannot be purchased for money at the present day. Our supply has been so enormous and the means for obtaining it so wonderfully systematized that, although more than half, and perhaps three-fourths, of the whole quantity has been cut off within a comparatively short time, yet the price has not seriously increased. While only 12 years' supply may be on hand, yet 12 years will not, of course, see it all cut off, for the very reason that the rapid increase in price will diminish consumption. Hard wood will be used instead of pine, and perhaps more than anything else will metal be brought to take the place of this wonderfully valuable wood. Year by year we find with the increasing price of timber generally that iron pushes its way into use, and it is possible that during the next half dozen years, stimulated by the higher price of wood, the metal industries may very largely find substitutes to take the place of pine. Already there are thousands of small articles made from sheet metal or from wire which formerly were only produced in wood, and this replacing of wood by iron must necessarily continue.



Third Prize Design.—Figs. 13 and 14.—Side and Front Elevations of Balcony on Side.—Scale, ⅜ Inch to the Foot.

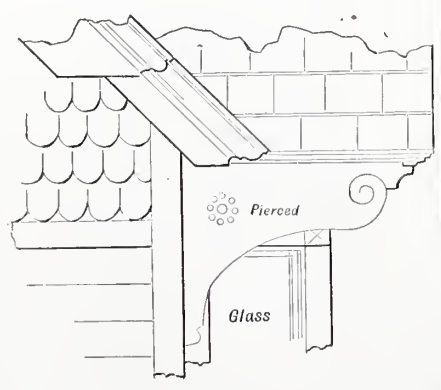


Fig. 15.—Finish of Front Corner of House at Line of Eaves.—Scale, ⅜ Inch to the Foot.

For the past 10 years the newspapers have been talking about paper boards and paper timber. Both have been made successfully. Twelve or 14 years ago we saw paper doors which in every respect were equal to those made from the best selected lumber, and yet they had very little lumber in them. Paper panels of all sizes and styles can be made which shall be strong, cheap and durable. The only reason why they have not come into general use is the extreme cheapness of pine lumber, and the fact that our slat, blind and door factories could turn out everything that was needed at a price which literally defied competition. When we need boards from straw, we shall have no difficulty in obtaining them, and yet they will have to be worked in an entirely different manner from those which are sawed from logs, though they will be equally applicable to the varied needs of builders.

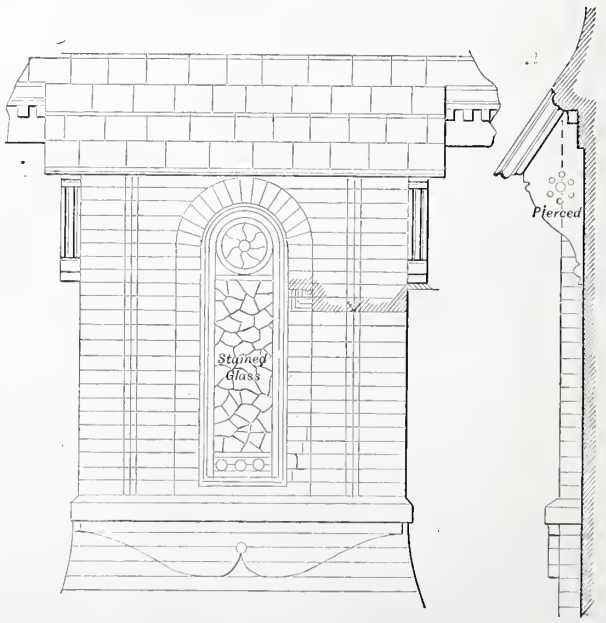


Fig. 16.—Chimney Window in Dining-Room.—Scale, ⅜ Inch to the Foot.

Everywhere in this country wood has been so cheap, and stone and metals so dear, that in building nobody has for a moment considered the question of using stone or brick or metal in any place where it could possibly be avoided, unless expense was thrown out of the question altogether. Whole cities are practically built of wood. To-day New York is a wooden city in a brick shell. Probably not over 10 per cent. of her buildings have anything but wooden beams and wooden finish inside. With the increasing price of timber, all this must change. Brick and mortar will be used for floorings, and in the place of floor timbers. If our masons were as skilled in their art as those of Italy, we might use masonry floors to advantage, even in private houses.

It is a sad thing when we consider that almost every town in the United States of

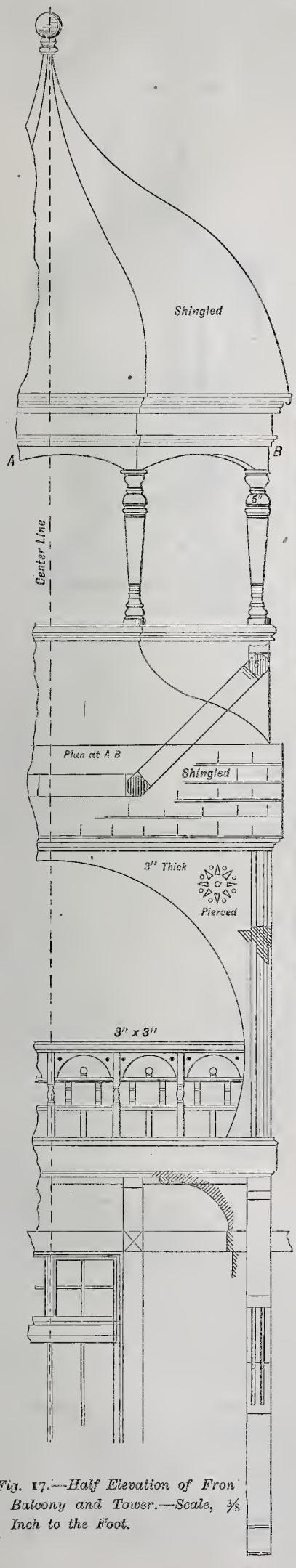


Fig. 17.—Half Elevation of Fron Balcony and Tower.—Scale, ⅜ Inch to the Foot.

more than 10,000 inhabitants may at any time be visited by a destructive fire, which will clean out, to use the expressive slang of the day, the best and largest portion. The abundance of timber has caused its almost universal use for building purposes. The gradual increase in its price and the convenience of carpentry work have induced styles of construction to be introduced which can be considered little less than fire-traps. Our buildings are so designed as to make their destruction almost certain when we once get a fire started in them. They are also designed in such a way as to make it very nearly impossible to reach a fire that has once got under headway. The studding, the lathing, the plaster and hollow floors, are so many flues lined with tinder to conduct a fire to all parts of the building, while the impervious plaster and the tight floor boarding prevent the water from reaching the fire. Whole cities are constructed on this plan, and only slight brick walls are used to veneer the outside of such buildings. Scarcely a month passes that we do not read of the complete effacement by fire of some little wooden-built town where even the brick veneer is omitted.

The philosophical engineer regards wooden buildings with a placid expectation of seeing them wiped from the face of earth by fire and replaced by something better. Our supply of timber is diminishing rapidly, its price is increasing in due proportion, which we may look upon as a most unmitigated blessing. The house of the future must be built of something besides white pine and spruce, and it will in all probability be brick. It is then only a question of time when all the more important wooden structures now in existence are burned up and something more durable and less likely to fall a prey to the flames erected instead. Unfortunately, the philosophical view is very seriously disturbed by the thought of the vast amount of suffering which will accompany this change in construction, and the enormous loss of wealth to the country caused by the effort to perpetuate our wooden cities.

The discrepancies between architects' drawings, plans and specifications, and the general shortcomings of their drawings, called out some pretty severe remarks in our issue for July, yet they were, we think, none too strong, for similar instances form a portion of the experience of every one who has had to deal with such matters An instance of the want of forethought on the part of an architect is found in the Pennsylvania Railroad depot at Philadelphia, which in its way is illustrative. It is an elegant structure, and was intended to be a model of its kind. Neither pains nor expense were spared in the construction, and yet the elegant stone staircase leading from the depot to the street, down which all incoming passengers must pass, is so steep and so illy fitted for its purpose as to be actually dangerous. About one-third the width of the stone steps have been covered by a rough wooden staircase, provided with a railing at the sides. Incongruous and discordant as this is, it is apparently a necessity, not simply for winter, but for summer also.

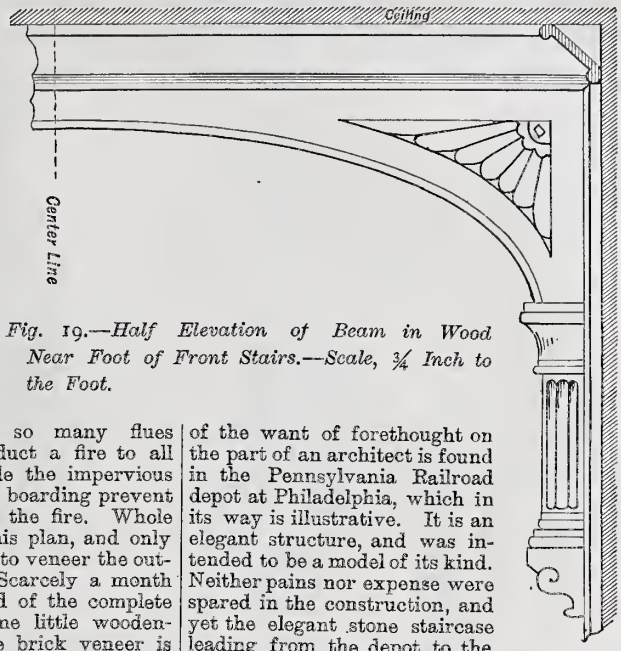


Fig. 19.—Half Elevation of Beam in Wood Near Foot of Front Stairs.—Scale, ¾ Inch to the Foot.

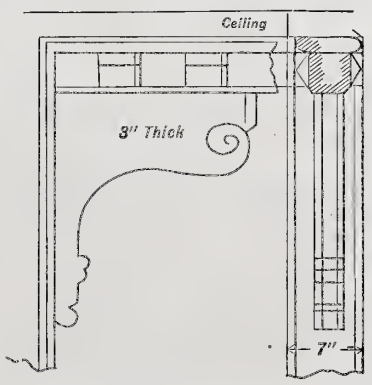


Fig. 20.—Wood Beam in Second Story.—Scale, ¾ Inch to the Foot.

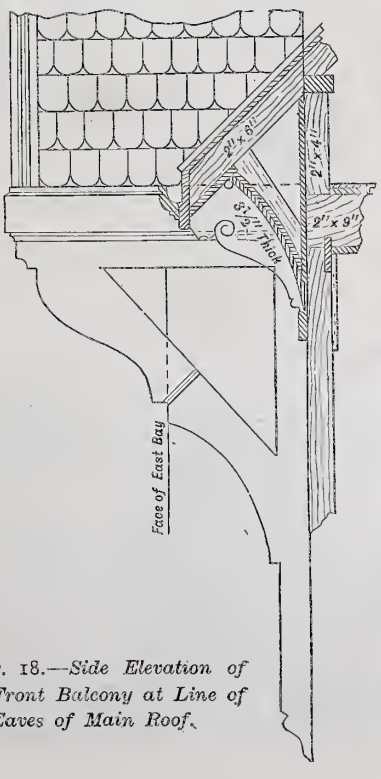


Fig. 18.—Side Elevation of Front Balcony at Line of Eaves of Main Roof.

The staircase in the Pennsylvania depot at Philadelphia is a good illustration of the fact that usual proportions must often be changed when a large scale is used, or a large building is constructed, simply because of the increase in size. So far as the actual necessity of the human frame in going up and down is concerned, we suppose that this staircase is correct and that the risers and treads are as they should be, but when stairways are broadened out to a width of 50 or 60 feet and handrails are 25 or 30 feet apart, the proportions have varied so much that the eye is deceived, and in this case where the descent is considerably more than an ordinary story (we should say roughly it must be 27 or 28 feet), an appearance of dangerous steepness is given by the ordinary proportions, which ought to be overcome by increasing the width of the tread very materially, reducing the hight of the risers and introducing broad and frequent landings. We suppose that the easiest 20-foot staircase in the world, if lengthened out to a descent of 150 or 200 feet and made five or six times its ordinary width, would have such an effect upon a person standing at the top as to make it seem the steepest and most dangerous staircase ever built. It would, in fact, seem to be practically little better than a ladder, and

the same mental care in descending would be necessary. A familiar example of this same apparent change in proportion, due to increasing the size, is often found in tapering objects like handles or pillars. A taper which is very beautiful for a knife handle, even if photographically enlarged will not give the eye the same impression as when smaller. Grecian columns of different sizes were never, we believe, made of the same proportions, the keen Grecian eye recognizing the fact that this single element of size must necessarily change the relationship of the parts in order to produce the desired effects.

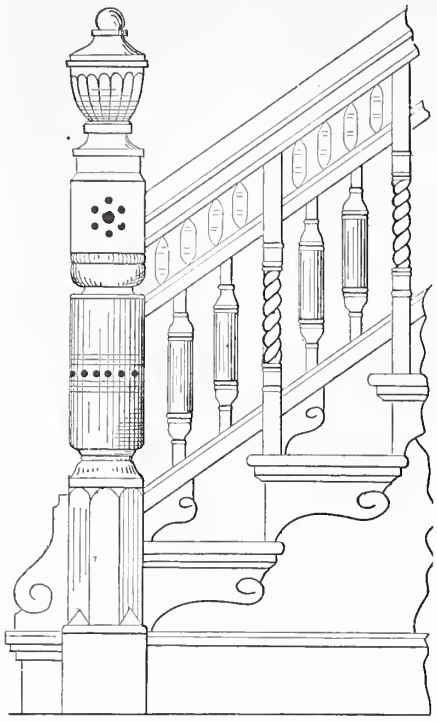


Fig. 21.—Elevation of Newel Post and Balusters, Front Stairs.—Scale, ¾ Inch to the Foot.

There is a very general feeling among architects, builders and the public generally, that in order to make a building architecturally beautiful, certain rules of proportion must be followed, and that fixed laws of proportion would determine the size and relationships of most of the leading details. A recent article in the London *Builder* calls attention in the clearest manner to the fallacy of this general belief, and shows how in each generation it has been necessary, on account of the work of some great artists, to add new rules to our laws of proportion, in order to include the good work which they have done. Proportion in buildings is probably very much like proportion in the human figure—it varies with the hight of the figure; and in buildings the proportions not only vary with the style, but also with the size of the building. The rules which produce a well-proportioned human being of 5 feet 6 inches ought not to be applied to one of 5 feet 10 inches or 6 feet 2 inches, nor should the rules applicable to a building of 50 feet front be applied to one of 250 feet.

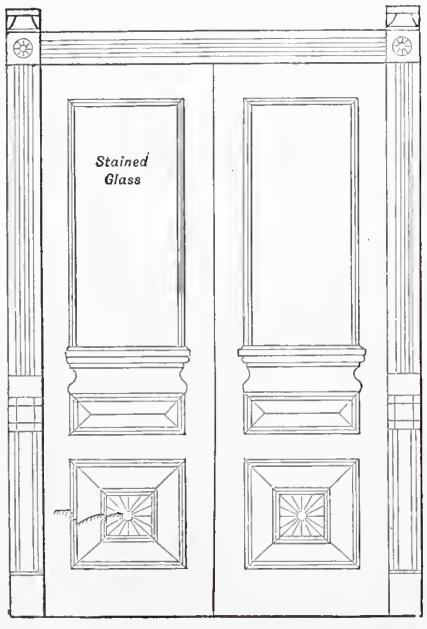


Fig. 22.—Elevation of Front Doors.—Scale, ⅜ Inch to the Foot.

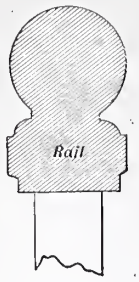


Fig. 23.—Detail of Hand Rail, Front Stairs.

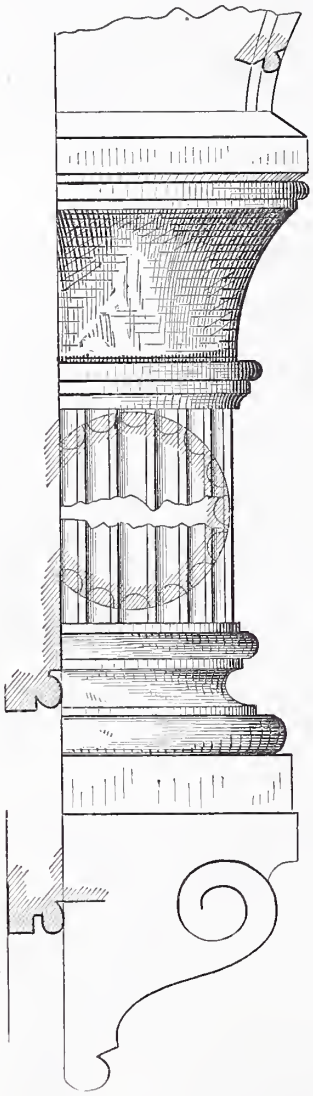


Fig. 24.—Bracket and Corbel in Front Hall.—Scale, ¾ Inch to the Foot.

A writer in a recent issue of *Mechanics*, says that either the architects of the day are hopelessly given over to fashion, or else their sense of beauty is dead within them. At the present day, in our leading architectural magazines, designs are published and styles are lauded which, to the artistically educated eye, are hopelessly bad from every point in which they can be judged. In outline they are absolutely ugly, and they are equally bad considered as solid objects. In fact, everything about them appears outrageous to the cultivated person who is not guided by fashion alone. Towers that do not tower above the roof tree, windows designed as far as possible to exclude the light, hideously ugly and square outlines, and buildings which are chiefly roof, are some of the abominations which one meets in the latest designs. Certainly, after what has been written by such intelligent critics as Ruskin, there can be no excuse for an architect designing a roof in which the rafters depart from straight lines intentionally, and run into those which are essentially ugly. Beauty and ugliness of line and of solid form are, we hold, absolute. They are no more a question of opinion or taste than an absolute right and wrong, or right and wrong as regards the great principles of human action. When the

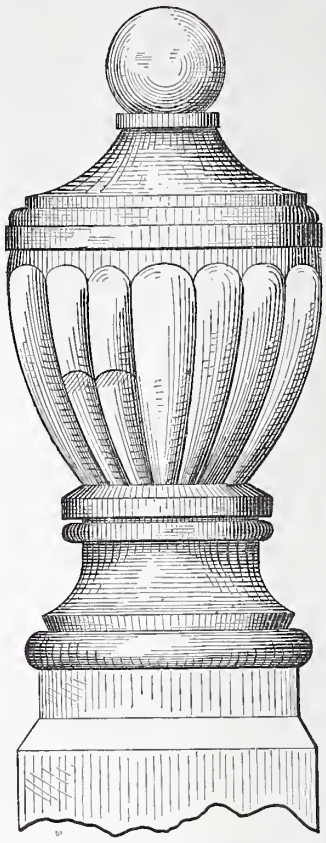


Fig. 25.—Detail of Top Ornament of Newel Post, Front Stairs.—Scale, 3 Inches to the Foot.

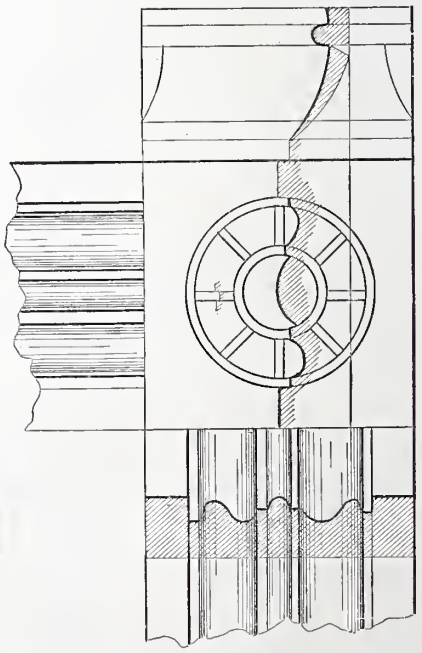


Fig. 26.—Upper Part of Architrave, First Story.—Scale, 3 Inches to the Foot.

architect temporarily introduces ugly lines into a portion of the building, he commits a crime which though not worthy of hanging,

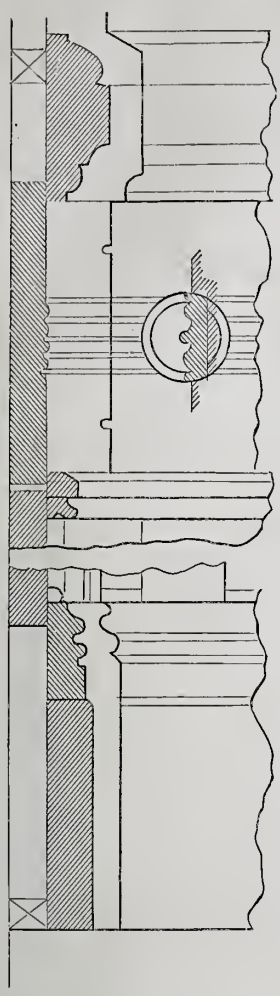


Fig. 27.—Details of Dado in Dining Room and Hall.—Scale, 3 Inches to the Foot.

ought to be sufficient to cause his "head to be cut off" in the railroading sense.

The Carpenter.

The carpenter is one of the strangest subjects that you ever saw. It grows in interest the mortise studied.

But the carpenter never deserts his friends. He does everything on the square.

Though a strong man, the carpenter cannot raise his frame without assistance.

Here is another funny thing about the carpenter. His finest work is his plane work.

The carpenter does everything by rule. It is rule or ruin with him.

With some men if you give them an inch they will take an ell. The carpenter, on the contrary, will not give you an L until he has taken a great many inches.

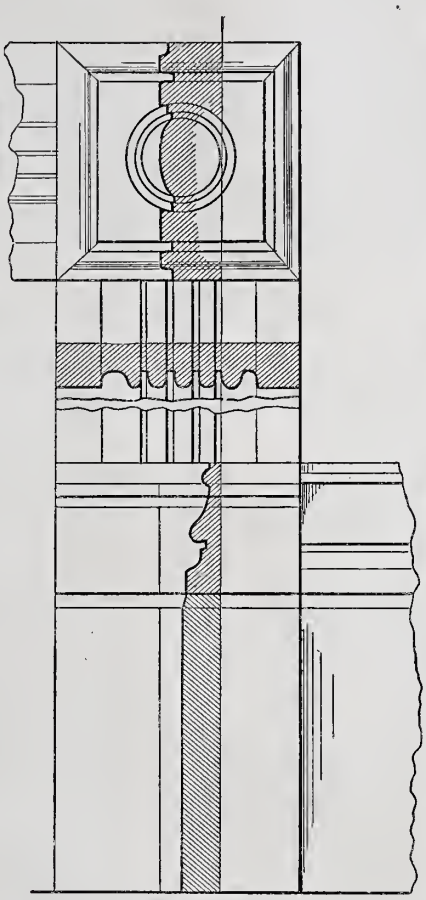


Fig. 29.—Architrave and Base in Second Story.—Scale, 3 Inches to the Foot.

The carpenter never deals in fiction. His stories have always a foundation.

When a carpenter sells a house he sells the cellar with it. The buyer is also frequently sold.

The most celebrated carpenter I ever heard of was the Carpenter of Rouen. You never saw him, but you have seen the ruin of the carpenter, perhaps.

The carpenter is not much of a fisherman, but is very fond of the angle.

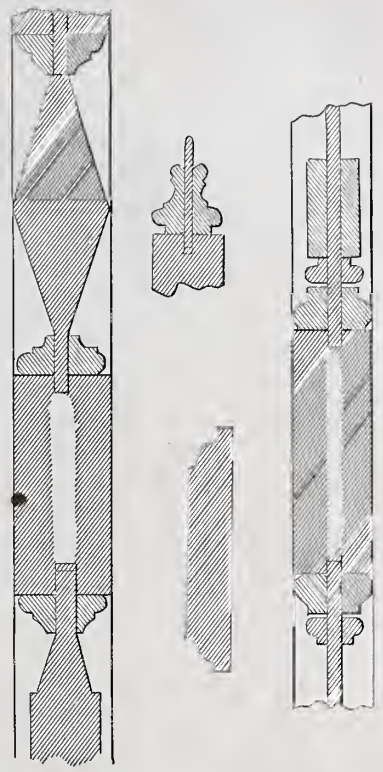


Fig. 31.—Details of Doors, Stiles, Panels, &c.—Scale, 3 Inches to the Foot.

The carpenter's voice is not first rate for singing. He wants timber. However, he is accurate in his measure, and, if a boss, is careful to keep good time.

It is a mistake to suppose that a carpenter ties his frame together with the knots in the timber.

Let us hope that the carpenter may continue to build up in good character, and, if at last he should fall from his scaffold, may a rope prevent his falling too far.

Concerning the relative value of cedar and pine for building purposes, an exchange says that a recent examination of a bridge, built some 12 years since, in which both woods were used, revealed the fact that the pine supports had so far decayed as to be entirely useless, while the cedar was still intact.

Fig. 28.—Double and Single Doors, First Story and Dado for Dining Room and Hall.—Scale, ⅜ Inch to the Foot.

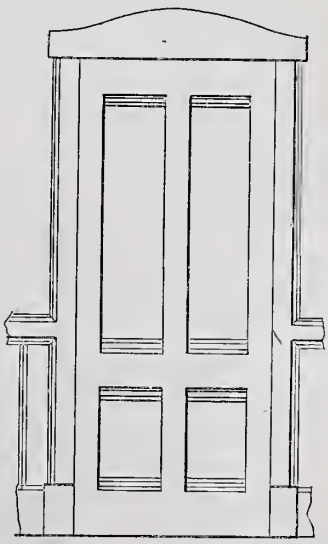


Fig. 30.—Elevation of Kitchen Door Showing Wainscoting.—Scale, ⅜ Inch to the Foot.

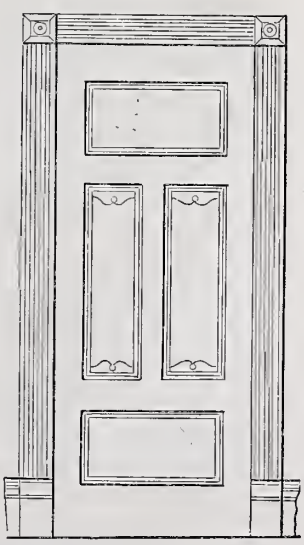


Fig. 32.—Elevation of Doors in Second Story.—Scale, ⅜ Inch to the Foot.

When hungry, the carpenter can dine off one of his joints, take rabbet plane for *entrée*, and his plumb for dessert.

The Seventh Competition.

As explained in our last issue, the decision in the seventh competition is referred to the readers of this journal. In the October number we presented three of the five specifications selected for publication, and at the present time we give the remaining two. The ballot for voting in this decision was published on the seventh advertising page of our October issue. Full instructions for voting in the decision of this competition will be found on the ballot. In this connection, however, we would remind our readers that no ballot will be counted that reaches us before November 6, or later than November 20. The specification receiving the largest number of votes will be awarded the first prize, $50. The specification receiving the second highest number of votes will receive the second prize, $30, and the specification receiving the third highest number of votes will receive the third prize, $20. We trust our readers will give this subject careful attention, and that every one will vote, in order that the decision may reflect the opinion of our readers at large, and not that of a small number. The specification receiving the first prize—that is, the highest number of votes—will be the one that will form the basis of our eighth competition, which is a detailed estimate of the cost of building the house. Full particulars concerning this, with all necessary information about the prices of materials on which the estimate is to be based, will be published in the December number.

"MIDNIGHT OIL."

SPECIFICATION

And description of work and materials required in the erection and completion of a frame dwelling house to be built on the N. W. corner of ———— for ————, Esq.

The work is to be done in strict conformity with these specifications, and the plans, elevations and scale details prepared for the same by "Midnight Oil," architect.

The proprietor reserves the right to reject any or all bids.

General Remarks.

The range in kitchen, and the gas fixtures throughout, will be furnished by the proprietor, and not included in this contract; but all other work, contemplated as shown by the drawings and described in these specifications, is to be done throughout in the best manner, with the best quality of new materials of their respective kinds, and to the perfect satisfaction of the proprietor and the architect. Each contractor is to set out his own work correctly, and is to give it his personal superintendence, keeping also a competent foreman constantly on the ground, and no contractor is to sublet the whole or any part of his work without the written consent of the proprietor. The architect, or his authorized representative, is to have at all times access to the work, which is to be entirely under his control, and may, by written notice, require any contractor to remove from the premises such of his material or work as in his opinion are not in accordance with the specification, and to substitute without delay satisfactory work and materials, the expense of doing so and of making good other work disturbed by the change, to be borne by said contractor. Each contractor is to clear away from time to time the dirt and rubbish resulting from his operations, and cover and protect his work and materials from all damage during the progress of the building, and deliver the whole clean and in perfect condition. All work and materials are to comply in every respect with the building laws, city or town regulations, and the directions of the Inspector of Buildings. Each contractor is to give to the proper authorities all requisite notices relating to work in his charge, obtain official permits and licenses for temporary obstructions, and pay all proper fees for the same, and for use of water for building.

The contractor for the mason-work is to have the care of the premises subject only to the right of other contractors, (the owner and the architect, or his representative to have free access thereto), until the sill is on, and is to provide and maintain all requisite guards, signals lights, during that time; afterward, the contractor for the carpeuter work is to take the care in the same way until the whole is completed.

Each contractor is to carry on his work at all times with the greatest reasonable rapidity, under the direction and to the satisfaction of the architect. The several portions are to be completed on or before the following dates:

Foundation to be ready for sill	September 25, 1882
House to be entirely inclosed	October 14, 1882
Chimneys and piers to be finished	October 18, 1882
Outside finish completed and interior ready for plastering	November 13, 1882
Plastering completed	December 8, 1882
Interior woodwork done	January 4, 1883
Painter's work completed	January 28, 1883
Hardware put on	February 1, 1883

Mason.

Excavation, &c. (See General Remarks.)

Batter-Boards. Excavation. Set proper batter-boards and mark out the building accurately, under the direction of the architect. Take off the sod and loam from site of house, and for 8 feet additional in width all around. Excavate the cellar to a depth of 5 feet below the present grade, making the excavation 8 inches wider all around than the outside of foundation walls; excavate trenches for all walls 14 inches below level of excavation for cellar; excavate for piers of piazzas 4 feet below present surface, also for side entrance steps to the basement. The earth taken from the excavations to be placed around the building, or as much as may be necessary, and properly graded off; and all surplus earth not required for refilling around walls of building are to be removed from the premises. After the footings are in fill in around the same, and well ram and consolidate the earth; the space around walls on outside of building (above footings) to be gradually filled up as walls are built, and the earth well rammed down solid, care to be taken in refilling and ramming not to injure the walls. If any blasting should be necessary for making the excavations above specified, ... cents per cubic foot will be paid by the owner for blasting, breaking up and removing the stone; but all stone so removed which may be suitable shall be used in building the cellar walls and piers, and for all stone so taken from the excavation and used in the building, the contractor shall pay the owner at the rate of .... cents per cubic foot. Excavate and build a privy vault, the same to be 5 feet in diameter in the clear and 25 feet deep below present ground and 25 in the rear of house; the same to be walled up with good sound blue limestone 9 inches thick, laid up dry; the upper 6 feet of vault to be laid in good lime mortar, with joints neatly pointed on inside, the whole to be domed over with a stone arch and provided with 18-inch iron ring and open lid.

Grad'g. Refill'g. Blast'g. Vault.

Foundations. (See General Remarks.)

Walls. Furnish all materials and build the outside cellar walls 18 inches thick to the underside of sills, see margin; the footings for same, and for interior brick walls of basement are to be in two courses, those for stone walls to be 6 x 26 inches, and 8 x 34 inches, those for interior brick walls 6 x 18 inches, and 8 x 30 inches; the footings are to be laid with the largest size stones attainable, to be well bonded, laid on full beds of mortar, to have all joints well grouted up full and solid at every course with liquid lime mortar. The walls above footings to be laid with the largest size blue limestone, laid on their natural beds with well-tempered mortar, and thoroughly grouted up full and solid at every course with liquid lime mortar. Level up carefully and bed the sill in cement mortar, and point up around it, and bed and point up around frames of basement windows. The mortar to be composed of clean, sharp and coarse sand, and fresh burnt Brown lime in the proportion of two bushels of lime to every five bushels of sand; the lime must be slaked in a box and run into the sand, and well and thoroughly mixed and tempered together; the grout to be composed of good lime mortar, properly tempered with clean water. The stonemason is to set the door and window sills of cellar, set and wall in the freestone steps to side area. All work appearing above the ground, including piers for piazzas, is to be of the best quality of rock-faced rangework in uniform courses, 5 and 6 inches thick, to be close jointed and bedded, and to have ½ inch margin drafts to all angles. The walls under piazzas are to be laid up good mortar work with clean blue-faced stone. All walls showing inside of building are to be neatly pointed up with good lime mortar; the exterior of walls showing above ground to be neatly pointed with colored cement mortar. The contractor is to furnish all scaffolding required for his branch of the work, leave openings for drain and water pipes, also to protect his work from the weather when necessary.

Mortar. Setting. Dressed Work. Point-ing. Scaffold-ding.

Brickwork. (See General Remarks.)

Walls. Bond. Trim-mer Arches. Mortar. Chim-neys. Struck Joints. Fire-Places.

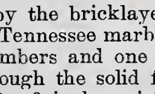
The brick partition walls in cellar and the four chimneys are to be laid with the best quality of hard-burnt brick (as they run in the kiln). The same to be laid wet (except in freezing weather), with joints thoroughly flushed up with mortar, and all well bonded with headers every seventh course, and not to exceed four courses to every 11½ inches in hight. Turn 4-inch trimmer arches on centers to all fireplaces, to be 20 inches wide by the length of the breast; level up with cement concrete or brickwork to receive hearths. All brick to be laid in good mortar, composed of clean, sharp and coarse sand, and fresh-burnt white lime in proper proportions, well mixed and tempered together with clean water. Build the chimneys as shown on drawings, with flues 8 x 12 inches, or 8 x 8 inches, as shown, of hard, brick in good mortar, to the underside of roof boarding; above roof to be of selected brick, formed according to drawings, and laid in mortar made with equal parts of lime and cement. Plaster every flue smoothly inside to the top, and clean out at completion. The brickwork of chimneys showing above the roof, and that showing in basement (except laundry), is to have the joints neatly struck on both sides.

Build the fire-places with the rough brickwork only at first, making the opening 3 feet high above top of joists, and putting in two ½ x 2 inch wrought-iron chimney bars to each opening, each bar to be 8 inches longer than the opening. After the house is plastered, provide all materials and build fire-places, &c., according to the drawings, and cover securely with boards for protection until the building is

delivered. The fire-place in parlor and library is to be lined with ornamental cast-iron plates, and to have facings of French majolica tiles; the hearths of royal-blue glazed American tiles in 3-inch squares, with border of two rows of 1-inch black glazed tiles, with one row of 3-inch Chelsea tiles. All to be executed in the best manner, the tile faeings to be secured in place with polished brass angle bars, and the hearths to be laid in Portland cement; make the hearth within the fire-place of good face brick. The dining-room and chamber over parlor are to have their fire-places lined with Philadelphia glazed brick, and to have a facing of Italian griotte marble 4 inches square and ⅞ inch thick with cavetto molding around the opening, also Minton's glazed tile and hearths of American unglazed red tiles without border, and to have face-brick hearth within the fire-place. All other fire-places are to be of selected pressed brick with borders of molded brick and hearths of pressed brick laid flat, with border of briek molded with half-round on the edge, mitered at the angles and set with the half-round projecting above the floor, all laid in red mortar and neatly pointed. **Paving.** The floor of entire cellar (except laundry and adjoining hall and closet) is to be made of a mixture of one part of best black diamond cement and two parts of clean sharp sand, well laid on a bed of 4-inch gravel, which is to be well rammed before cement is put on. **Brick Filling.** All exterior walls are to be filled between the studdings with brick laid in mortar from the top of wooden sill to the hight of 8 inches above the first floor. **Cistern.** A cistern is to be built and excavations made for the same about 12 feet to the center from the rear line of house; the same to be 8 feet in diameter in the clear and 12 feet deep in the clear of crown, the bottom to be made of concrete, composed of equal parts of English Portland cement and clean screened gravel and sharp and coarse sand well mixed and tempered together with clean water, the bottom to be 8 inches thick, when finished, and put in in two courses, each course to be well rammed down solid, the bottom to be put in and left standing four days before wall is built. The walls are to be in two 4½ inch rings with a ¾-inch space between, the crown to be 8 inches thick and have a manhole 30 inches in diameter with a 9-ineh wall carried up to receive freestone top. The brickwork of cistern is to be of good arch brick laid in cement mortar, to have all joints well and thoroughly filled up solid, and the space between rings to be thoroughly grouted up full and solid with liquid cement mortar. The outside of crown is to have one good coat of cement plaster well put on before being covered with earth, the inside of cistern is to have one good coat of cement plaster well troweled and finished with one coat of liquid cement put on with a brush and well worked in. There will be two openings left in crown for supply pipes from roofs, and the cistern must be perfectly watertight and guaranteed for one year. **Catch-Basin.** The catch basin is to be constructed similar to cistern with 4-inch brick walls and bottom and 20-inch manhole for iron ring and lid; the same to be 3 feet 6 inches in diameter and 5 feet deep, and excavations made for the same. **Scaffolding.** The contractor is to furnish his own scaffolds, which will be on trestles, as no padlock holes will be allowed in the work.

Stonework. (See General Remarks.)

All cut stone used throughout the building is to be of the best quality of Ohio freestone, of a uniform color, free from stains, iron, etc. **Sills.** Door sill in basement area to be 8 x 18 inches; cellar window sills to be 4 x 8 inches; **Steps.** steps showing inside area to be 8 x 14 inches, and 6 inches longer than width of opening; the same when set to show 12 inches tread (the steps will be walled in by stonemason). **Copings.** The coping around area to be 8 x 12 inches, set in cement, and properly clamped at the joints with wrought-iron clamps housed and cemented into stones. The coping for four chimneys is to be made of a solid piece for each chimney, 4 inches thick, and beveled, with holes cut for the flues. **Cistern Top.** The cistern top is to be 3 feet 6 inches square and 8 inches thick, and have holes cut for chain pump and 20-inch manhole, and a drip worked on top for waste water; a 4-inch stone lid is to be housed over manhole: the lid is to have a strong wrought-iron ring to raise the same.

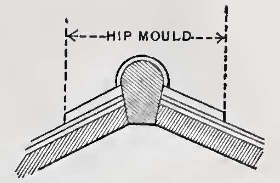


Hearths. The hearths will be furnished and set by the bricklayer. **Regist'r Frames.** There will be four register frames of red Tennessee marble, 2 inches thick; three in second-story chambers and one in bathroom; to have the openings cut through the solid for 12 x 16-inch registers in chambers, and 8 x 8 inch register in bathroom, all set vertical, each frame to show clear margin at each side of register of 3 inches; each frame is to have a shelf at top projecting 1 inch at front and ends; the face and sides of frames, top and edges of shelves to be polished and countersunk on face; the measure for frames to be taken at the building after the plastering is done, and the frames to be set by stonecutter. **Shield.** An ornamental cut shield, 6 inches thick, is to be built in chimney on south elevation.

Galvanized Iron, Tin and Slate Work.

(See General Remarks.)

The crestings and finials on all ridges showing on main roof and on gable of front piazza, and all hip molds, and the down spouts are all to be made with the best quality of No. 26 **Gal. Iron.** galvanized charcoal iron, well riveted and soldered and securely fastened to the building. The hip mold to be put up for all hips on slate roofs, and to be of 10 inch girth.



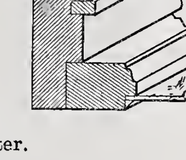
Down-spouts. The two down-spouts from gutters of main roof are to be 4 inches, of galvanized iron, to be run down and connect with the drain pipes leading to the cistern; the above down-spouts are to be provided with Howell's patent cut-off, to throw water into drain leading to street when necessary. The front and rear piazzas will have no gutters and no down-spouts. The two main down-spouts are to be of Irwin & Reber's patent expanding water conductors, securely fastened to the wall; the same are also to be provided with wire-basket strainers in the gutters above.

Tin. The gutters of main roof and all valleys are to be lined with I. C. charcoal roofing tin, in plates 14 x 20 inches, well nailed and soldered. The tin for valleys is to be 20 inches wide, and is to be painted on both sides before being laid. Flashings of heavy tin, painted on both sides, are to be turned up at least 6 inches against walls, chimneys, &c., and counterflashed into the joints. Flashings are to be turned up under weather boarding and shingles where necessary. Gutter linings are to run up at least 6 inches under the slate, and all gutters are to have proper fall, and to be drained to the two down-spouts. **Painting of Tin.** All tinwork is to have one good coat of Venetian red and oil on the under side before being laid, and all rosin to be removed from upper side before it is painted. **Tin covers.** Molded tin covers are to be furnished for all flue openings.

Slate. The roof of entire building, including that over front and rear piazzas, is to be covered with the best quality of non-fading green slate, with three courses of black Virginia slate on top and bottom. All slate to be of a uniform color, in plates 10 x 20 inches, free from spots, and to be well nailed, and not more than 8½ inches of each slate exposed to the weather; the lower course to be double thickness and provided with wooden tilting strips. **Roofing felt.** The sheathing for slate roofs is to be covered with a layer of asbestos roofing-felt with 3-inch lap. **Spout to tank.** One rear spout is to drain first into the tank in attic, and an overflow from tank with mouth funnel-shaped leading to down-spout.

Ironwork. (See General Remarks.)

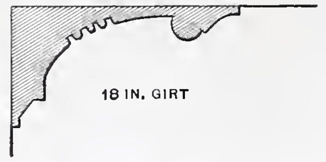
Sash-weights. Sash-weights of cast iron for all sliding windows, to be of required size and number. **Window Guards.** Ornamental wrought-iron guards (as per ¾ inch scale detail), are to be put up for 9 cellar windows; the same are to be well secured to the wooden frames by means of wrought-iron hooks and screws, (see margin); the hooks to be of ⅛ x 1 inch iron, with two screws. All iron straps for turning trimmer arches of fire-places are to be furnished. The chimney of dining-room is to have a ¾-inch iron rod with proper plates, bolts, &c., to fasten to the roof. **Anchors.** Rafters of main roof are to be anchored down to attic joists every 10 feet, by ⅛ x 1 inch straps of iron, well spiked to the same by the carpenter.



Plastering. (See General Remarks.)

Verifying Furrings. The plasterer is to examine and try all ceilings, partitions, and furrings, and is to notify the carpenter of all that are not square, true, plumb, and level, and see that they are corrected before lathing, and that all are firm and secure. **One Coat Work.** Lath and plaster basement ceiling one heavy coat, well troweled and smoothed. **Laths.** All stud partitions throughout, and ceilings, and the entire attic, and the stud partitions of basement showing in hall and on back stairs, are to be lathed with the best quality of dry sawed pine lath, all laid ⅜ inches apart, and breaking joints every six courses, and over all door and window heads. **Three Coat Work.** All the above partitions (including the brick chimneys) of first and second floors (except closets), are to be plastered two good coats of brown mortar, and one coat of hard white finish well troweled to a face; the walls of halls and passages, and entire first story, are to have the last coat a hard gray-sand finish, well and thoroughly troweled to a face. **Two Coat Work.** The closets throughout, the entire attic, and the brick walls and stud partitions, showing in laundry and back stairs, are to have one coat brown mortar, and one coat of white lime and sand skin. The stone walls of laundry are to be plastered with a good coat of cement mortar, composed of one part of good black diamond cement, and two parts of clear, sharp sand, and to be well troweled. **Mortar.** The mortar for the brown coats is to be composed of clean, sharp and coarse sand, fresh wood-burnt white lime, and long winter ox hair in proper proportions, well mixed and tempered together with clean water; the hair to be well soaked and beaten, and not mixed until lime has been thoroughly slaked and cooled; the lime must be thoroughly slaked in a box, and run into sand through a No. 20 sieve, and properly mixed and tempered together. The putty for the skim coat is to be run at the same time when making brown mortar. The finishing coats of all walls to be run from floor to ceilings without joinings. Run

Cornices. molded cornice, uot over 24 inches girt, in parlor, library and dining-room ; and molded cornice, not over 18-inch girt, in first and second story main hall, (see margin). Plant plaster centerpieces in parlor, library, dining-room, and three chambers over the same, and first and second story main hall ; centers to cost about $60, put in place.



Beams. Form beam (as per scale details) over main stairs in first-story hall, and for alcove in second-story main hall.

Scaffolding. The contractor is to furnish all scaffoldiug required for his branch of the work, clean all the mortar off the floors, and sweep out the house, aud leave all ready for the wood finish ; patch up and repair all the plastering at the completion of the building, and leave all perfect.

Thimbles. Sheet-irou thimbles are to be furnished and set for all flue openings. Hot-air pipes leading to secoud floor are to be covered with 4 x 24 inch strips of slate, nailed to the studding, with ½-inch lap to give key for plastering.

Heating Apparatus. (See General Remarks.)

Furnace. There will be one portable cast-iron furnace (Ruby No. 51 or equally as good), in basement, as shown on the plan, to be set on a brick foundatiou, to have cold-air shaft taken from window near furnace. The air-shaft to be constructed with white-pine flooring, and fitted with a pivot-valve to regulate the air supply. The contractor for furuace is to furnish woodwork for air-shaft.

Hot Air Flues. There will be three hot-air flues 4 x 20 inches, running from basement to second-story chamber, to have a rouud collar at bottom from 10-inch pipe, and register box at top for 12 x 16 inch registers, and one to bathroom 4 x 8 inch, with a round collar for 6-inch pipe, and register box for 8 x 8 inch register. One each to hall, parlor, library and dining-room, to have 12-inch collars at bottom, and register boxes for 12 x 18 inch registers in the floors. One each to pantry and toilet-room, to have 6-inch collars and register boxes for 8 x 8 inch registers in the floors ; register boxes on second floor to be set 4 inches above joists, the top of round collars 6 inches below joists.

Thimbles. Provide one 12-inch and one 6-inch thimble cut to an angle for the passage of hot-air pipes in basemement through brick wall and stud partition, also a 9-inch collar for smoke pipe of furnace.

Hot Air Pipes. There will be four 12-inch round, three 10-inch round and three 6-inch round hot-air pipes running from the furnace to the collars in walls or in floor. All hot-air pipes and flues and the smoke-pipe are to be made of I X bright tin, the corners to be double-seamed, and pipcs swedged on both ends at each joint, and to be well braced on the inside. Elbows to be made of four pieces with corners double seamed. Ali pipes are to have one good coat of asphalt varnish on the outside.

Regist's. There will be required three 12 x 16 inch, four 12 x 18 inch and three 8 x 8 inch black enameled valve-registers of Tuttle & Bailey's make, or equally as good.

Painting and Glazing. (See General Remarks.)

Glass. The glass for entire first and second stories (except otherwise specified) is to be of the best quality of double strength French glass ; remainder of house is to have the best quality of double strength Pittsburgh glass, same quality, for small lights ; all glass is to be free from flaws, &c., and to be set in putty, well-bedded, tinned and large lights back-puttied.

Stained Glass. The transom over front entrance door, also panels in inner vestibule doors, and transom over same, are to have rolled cathedral stained glass, set in lead bands, with braces of ¼-inch round rods, round dots to be of blown glass, and all well secured to the wooden rebates.

Ribbed Glass. The side hall doors are to have ¼-inch ribbed glass in upper panels. All glass is to be left sound and free from paint upon completion of the building.

Painting. All sashes are to be primed before being glazed. The runners of box-frames, the treads and risers of all stairs, and the kitchen and laundry floors are all to be oiled three good coats of best boiled linseed oil. All iron, galvanized iron and tinwork is to be painted two coats of best metallic paint, and brick chimneys to have three coats (one of ocher and two of white lead), all tinted Indian red. All exterior woodwork is to be primed with one coat of yellow ocher and two coats of white lead, oil, &c., of tints as directed—the first story green, the second story yellow, and the doors, trimmings and veraudas red. The interior dressed woodwork in basement and attic is to be painted two good coats of white lead, oil, &c., tinted a slate color. The interior of closets, including shelving and finish, is to be varnished two good coats of best copal varnish. The sashes are to be painted three good coats, and grained in imitation of mahogany on the inside, and varnished one coat of coach varnish. The outside of all doors aud frames for the same (except front door) is to be graiued in the best imitation of oak, aud varnished one good coat of coach varnish. The front door and entire vestibule is to have one coat of Wheeler's patent filler, and then three good coats of best raw linseed oil, well rubbed with rags after each coat. The hardwood finish of parlor, first-story hall, library and dining-room is to have first a coat of Wheeler's patent filler, then two coats of best medium shellac, and then to be varnished two good coats of best rubb varnish, well rubbed with pummice-stone and raw linseed oil in the best cabinet finish ; the best rubb and coach varnish to be used for inside shutters ; remainder of first and second stories is to have four good coats of best copal varnish, and well sandpapered. Stain sheathing under piazza roofs with one coat of light oil of cresote. Putty-stop thoroughly and smoothly all work inside and outside after the first coat and before the last coat, coloriug the putty to match the wood after darkening.

Plumbing. (See General Remarks.)

Pump. A good chain-pump, with cast-iron box, galvanized-iron chain, wooden tubes, &c., all complete, is to be put up for the cistern, and the box well screwed to the stone lid.

Boiler. There will be a 40-gallon galvanized-iron boiler of Gibson's patent in kitchen, with hand-hole, the same to be set on cast-irou pedestal stand, to be supplied from tank in attic ; the same to have all necessary stop, slush and waste cocks to same, the boiler to be connected with water-back of range when set, the plumber to furnish all couplings.

Tank. There will be a tank 5 feet wide and 3 feet deep and 5 feet long in the attic, the same to be put up by the carpenter, but to be lined by the plumber with 6-pound sheet lead.

Pump. There will be oue of Coleman & Co.'s 2½-inch double-acting brass lift and force pumps at sink in kitchen, to have suction pipe of 1-inch extra strong lead pipe, with a brass strainer in the bottom of cistern, aud with the tank by meaus of a similar pipe ; the pump to have an outlet at sink to be used for ordinary purposes.

Bath-tub. The bathtub is to be one of Steeger's make, of 14-ounce planished copper, and to be provided with silverplated trimmings, such as combination cocks, with hose and sprinkler, overflow, Powell's plugs and strainer, 1¼-inch light lead waste-pipe, and 1½-inch lead trap with trap screw, all complete.

Wash-stands. There will be three wash-stands on second floor and one on first floor, with 14-inch marbled wash-bowls, with 1¼-inch countersunk white Italian marble slabs, and ¾-inch backs and sides of same material, 18 inches high, the same to have Powell's plugs, strainers, overflow and silver-plated four-arm compression basin-cocks, and 1-inch light lead waste-pipes, with 1¼-inch lead traps with trap screws, all complete.

Water Closets. There will be one water-closet in bathroom, and one on first floor, the same to be of Demorest's improved water-closet, with porcelain bowl, iron trap, lever pull, silver-plated handle aud cup, &c., all complete, and provided with an enameled cast-iron urinal safe. A 4-inch cast-iron soil-pipe is to be put up for each water-closet, and connecting with the drain pipe to the vault ; the soil-pipes to be carried up 24 inches above the seats, and then connected with a 4-inch spiral-seam galvanized-iron vent-pipe leading up through roof, with a globe ventilator on top of each vent-pipe.

Sinks. There will be two cast-iron sinks on first floor, one in kitchen and one in pantry, the same to be 6 inches deep, to have brass strainers, overflow, 1½-inch light lead waste pipe, with 1½-inch lead trap and trap screw, all complete.

Wash-tubs. The three washtubs in laundry will be furnished by the carpenter ; the same are to have brass compression cocks, Powell's plugs, 1¼-inch light lead waste-pipe with brass strainers, 1½-inch lead trap with trap screws.

Floor Lining. The floor under water-closets to be lined with four-pound sheet lead, with standing rim 3 iuches above floor all around, and 1½-inch medium lead waste-pipe with strainer trap, and supplied by means of a ¼-inch lead pipe from supply pipe of water-closet.

Supply Pipes. There will be a ⅝-inch extra strong lead pipe from tank to the boiler and a 1½-inch light lead overflow tell-tale pipe from tank to the sink in kitchen. The ⅝-inch supply pipe from the tank and the ⅝-inch extra strong lead hot-water pipe from boiler are to extend to the bathroom and to the wash-tubs in laundry ; to have ½ inch extra strong lead branches for the hot and cold water supply to the sinks, bath-tub and wash-tubs and ⅜-inch extra strong hot and cold water supply pipes to the washstands, and ½-inch extra strong cold water supply to the water-closets.

Waste Pipes. The waste pipes from two sinks, washstands and wash-tubs are to be connected with a 2-inch cast-iron pipe leading to drain pipe under wash-tubs, and provided with a 1½-inch light lead ventilating pipe leading to laundry smoke flue. All connections between lead and iron pipes are to be made with brass thimbles, and all iron pipe is to have the joints well leaded and to be secured at every joint by means of strong iron hooks.

Drain Pipes. Glazed stoneware drain pipes are to be laid of various sizes from the two soil pipes to the vault ; also from under the wash-tubs to the catch-basin, with an overflow from catch-basin to the side street ; also from two rear down-spouts to the cistern and to the catch-basin so that the water can be thrown where required ; the drain pipes are to be laid with proper fall and the joints to be well cemented. All necessary Y aud T branches, curves, bends, &c , are to be furnished for iron and stoneware drain pipe.

Digging and Refilling. All digging and refilling necessary for laying the water and

drain pipes is to be done without extra charge. *Stop Cocks.* The several branch supplies (hot and cold) to have separate stops and wastes between the main supply and the discharges.

Gas Fitting. (See Goneral Remarks.)

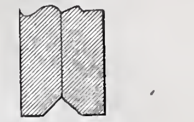
Gas pipes are to be laid from a Sunlight Gas Machine to be furnished and set in front cellar. Pipes are to be laid throughout entire house including cellar and attic, and tapped and branches made where the proprietor may desire, making drop lights for parlor, first-story hall, library and dining-room, and drop light and side brackets in kitchen and four chambers, and brackets only in second-story halls, bath-room, four in attic and four in cellar, and one in pantry and toilet-room.

Hardware. (See General Remarks.)

Sliding Door Furniture. The sliding-doors between library and dining-room are to be hung in the best manner with Prescott's patent balance hangers, complete; to have Russell & Erwin's solid bronze sunk handles, pattern No. 332, dark finish, and bronze astragal-face sliding-door locks and pulls of the same make, pattern No. 333. *Butts.* The front outside double doors are to be hung with 6 x 6 inch Russell & Erwin's fancy solid bronze dark-finish acorn loose-pin butts, of pattern No. 15, three to each leaf, with steel bushings and steel washers. All other doors in first-story hall, vestibule, parlor, library and dining-room are to be hung with 5 x 5 inch bronze acorn, steel washer, japanned loose-joint butts, three to each door or leaf of double door. All other doors of first and second floors are to be hung with 4 x 4 inch japanned loose-joint butts, acorn butts with steel washers, two butts to each door. Cellar and attic doors and sashes are to have plain cast iron hinges. Transoms over vestibule doors are to be hung on bronze hinges, to suit those of doors below. Brass hinges and Kahala spring catches for doors under sinks and wash-stands. Brass hinges and white porcelain knobs for water-closet seats. *Locks.* The front door is to have Enoch Robinson's patent front-door mortise lever lock, with bronze face and striking plate and night-latch, with one key to the large lock and four to the night-latch. All otber doors throughout first and second stories are to have Russell & Erwin's, Corbin's (or any other good make) 4 x 4 inch mortised lock, with brass face and striking-plate, brass bolts, and German silver or plated keys; no two keys in the house to be alike; the side entrance door is to have in addition a Yale rim night-latch, with two keys. Cellar and attic doors are to have 5-inch cast-iron locks, with brown mineral knobs and japanned trimmings. *Knobs.* The front outside doors are to have Russell & Erwin's fancy solid bronze dark-finish 2½-inch knobs, pattern No. 923, on both sides of one leaf only. Doors in vestibule, parlor, library and dining-room are to have Russell & Erwin's 2¼-inch fancy solid bronze dark-finish knobs, pattern No. 933. Double doors are to have knobs on one leaf only. The remainder of first and second stories are to have hemacite knobs and rose with bronze escutcheons. *Bell Pulls.* Bell-pulls are to be furnished for front and side doors to correspond with the door-knobs. *Bolts.* The outside front and vestibule doors and double doors opening into hall, are to have bronze metal flush bolt at top and bottom of the leaf which has no lock. Bedroom doors leading into halls and passages, and side entrance doors, are to have Ives's patent brass mortised bolts with bronze roses and bronze keys. Cellar and attic sashes are to have button fastenings and hooks with staples to fasten them to the ceiling. All sliding sashes are to have Morris's patent sash lock of solid bronze in first-story hall, vestibule, parlor, library and dining-room; bronzed iron with plated drops elsewhere, and two pulls on lower sash to correspond. Bronze hinges, bronze knobs and bronze hooks for parlor, library and dining-room inside shutters; rooms over the same and second-story hall inside shutters are to have brass hinges, white porcelain knobs and plated trimmings; remainder of first and second stories are to have outside shutters, with Lull & Porter's self-fastening hinges and fastenings. Put heavy triple hooks of japanned cast iron in closets; and all brass hardware to be put on with brass screws; plated, with plated screws; bronze or bronzed, with bronzed screws; and japanned, with blued screws. Interior transoms are to be hung on Schroeder's surface pivot, and to be provided with Kahala spring-catches. Kahala bell lever from front bed-room to servant's bedroom. Speaking-tube from second-story front hall to kitchen; all necessary wires, tin tubing, porcelain mouthpieces, &c., to be furnished. Drawers of wash-stands are to have brass drop-handles.

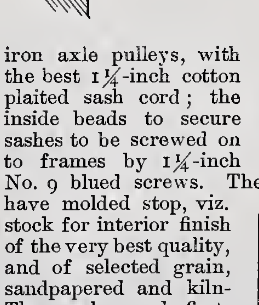
Carpenter Work and Lumber. (See General Remarks.)

Lumber. All the lumber throughout is to be of sound, well-seasoned white pine (unless other wood is specified), free from unsound knots, shakes or other imperfections. *Lintels.* Seasoned pine lintels are to be put over openings in cellar walls, and over interior openings in brick walls. Dressed post 6 x 6 inches, to be put up in attic. *Joists.* Joists for first story to be 2 x 12 inches, placed 12 inches from centers; those for second story to be 2 x 12 inches, and for attic 2 x 10 inches, all placed 16 inches from centers; *Bridging.* all to be well bridged by two rows of 1 x 3 inch cross-bridging. *Framing.* Double-pinned joists for all partitions running parallel with floor joists, and for framing around stairs, fire-places; single framing for chimneys; double-pinned joists are to bave the lower edges chamfered where plastered. *Verandas.* The joists for verandas are to be dropped below the other joists of first floor, and to be 2 x 8 inches, resting on 6 x 8 inch beams, supported on 6 x 6 inch locust posts, and framed into 4 x 8 inch end framings.

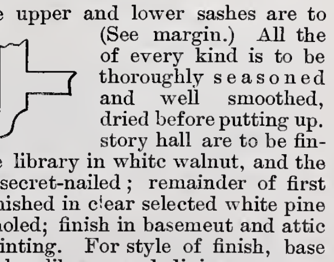


Rafters. Rafters for main building to be 2 x 8 inches (well spiked to 4 x 6 inch wall-plate), placed 16 inches from centors, and those for verandas to be 2 x 6 inches, placed 16 inches from centers; all rafters are to have ends projecting over wall, dressed and cut ornamental, as shown on detail; the valleys, hips and ridge rafters are to be put up in the strongest manner. *Sill.* Sill for outside wall to be 6 x 8 inches, halved at corners and spliced together, rafters anchored to attic joists, (see ironwork). *Studs.* Studs for outer wall to be 2 x 5 inches, tbose for inner partition 2 x 4 inches, all placed 16 iuches from centers; partition caps 3 x 4 inches, soles 2 x 5½ inches; the entire structure is to be balloon-framed, studs to be in one length from sill to plate, and well braced in the strongest manner; door posts double. *Sheathing.* All roofs throughout, including piazza roofs, are to be sheathed with third common ⅞-inch white pine flooring and secret-nailed, and gutters lined with the same material. *Flooring.* The floors of first and second stories (except kitchen and first-story hall) are to be made of second common ⅞-inch white-pine flooring, in 3 inches, 4 inches and 5 inches, and secret-nailed; first-story hall is to have a border 24 inches wide, of alternate stripes of black walnut and cherry, in 3-inch strips, tongued and grooved, all secret-nailed and mitered at the corners, and the center portion to be of selected Georgia yellow pine flooring, in 3-inch strips; the kitchen floor is to have first common ⅞-inch yellow-pine flooring and secret-nailed; floors of verandas are to have the joints white-leaded and to be of 1⅛-inch flooring, the floor of attic is to be of 3d. common white-pine flooring; laundry floor is to be made of 2d. common white-pine flooring, secret-nailed, and laid on 3 x 4 inch cedar sleepers placed 16 inches from centers; the interstices between cedar sleepers are to be filled up level on top with concrete and tin cuttings. The ceiling of piazzas is to be made of 1st common beaded white pine flooring not over 5 inches wide and secret-nailed. *W'ther Board'g.* All outside walls are to be covered with 3d common dressed ⅞-inch boards, then with a layer of Rock River Paper Co.'s sheathiug board and the entire first story all around to be covered with 2d common dressed 6-inch weatherboarding showing 4¾ inch to the weather; the upper part all around is to have 6 x 18 inch cut and dressed shingles ⅜-inch thick at the end, showing 6 inches to the weather, the same to be cut ornamental where shown, and to be primed on both sides before being put on. *Outside Finish.* The exterior woodwork, such as cornices, gables, verandas, sill-courses, water-table, 1⅜-inch corner boards, 1⅜ inch finish, are all to be put up in the best manner, as per details and elevations. All outside steps are to be constructed in the strongest manner of dressed lumber. *Stairs.* The staircases from basement to attic are to be constructed on strong bearers, 2 x 12 inches, well braced with 1⅛ inch yellow-pine treads with molded nosings and ⅞-inch white risers. The main stairs are to have black walnut newel-post, hand-rail, and string, and cherry balusters, as per details, and secret-nailed; back stairs from basement to second floor are to be boxed with a molded cherry hand-rail on one side, supported on neat iron brackets.

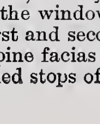
Sashes.



The cellar and attic sashes are to be 1⅜ inches thick, hung to 1¾-inch chamfered frames 6 inches wide, and provided with weather-strips, and made perfectly water-tight (see margin). All other windows are to have double-boxed frames with 1¾-inch sashes hung on best 2-inch iron axle pulleys, with the best 1¼-inch cotton plaited sash cord; the inside beads to secure sashes to be screwed on to frames by 1¼-inch No. 9 blued screws.

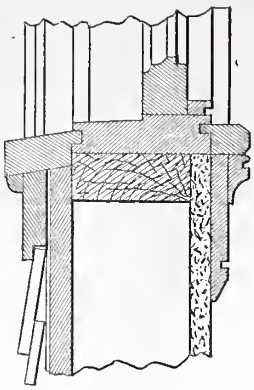


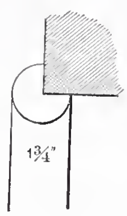
The upper and lower sashes are to have molded stop, viz. (See margin.)



All the stock for interior finish of every kind is to be of the very best quality, thoroughly seasoned and of selected grain, and well smoothed, sandpapered and kiln-dried before putting up. *Finish.* The parlor and first-story hall are to be finished in black walnut, the library in white walnut, and the dining-room in oak, and secret-nailed; remainder of first and second stories to be finished in clear selected white pine for varnishing, and putty-holed; finish in basement and attic to be of white pine for painting. For style of finish, base and doors, see detail. Parlor, library and dining-room are to have panel-backs under the windows to match the finish in rooms; remainder of first and second-story windows are to have cherry stools and pine facias (see margin). Yellow pine carpet-strips and turned stops of hard wood are to be

put up for all doors. Molded imposts for all transoms; the transoms to be 1¾-inch thick, hinged for outside transoms, and pivoted for interior ones. All square corners are to be protected by turned staffs with molded cap and square plinth **Shelv'g.** to receive the base. The kitchen sink is to be fitted up with draining board, closet underneath, splash-board &c., all complete. The fronts of wash-stands, water-closets and bath-tub are to be made of black walnut, with paneled doors and drawers for wash-stands, and paneled front provided with molded cap and floor strip for water-closet and bathtub; thc water-closct is to have doublo seat, paper-box, &c., all complete. All the above fronts, caps, seats, &c., are to to be screwed together with blued screws. All closets throughout are to be fitted up with movable shelves, hook-rails, &c., in the most complete manner; kitchen and laundry closets to have five shelves, bedroom closets two shelves and a hook-rail. Hanging shelf 3 feet by 8 feet to be put up in vegetable cellar. All necessary molded boards are to be put up for bellhanger and plumber. The outside sills of windows to be of oak. Stairs to be protected with rough boards, and cellar and first-story openings are to be boarded up until doors **Piazzas.** and sash are hung. The piazzas are to be constructed as per detail drawing, the balustrades, braces, turned, carved and ornamental work to be all of good seasoned white pine. The shield and sun-dial on the South side are to be put up in the neatest manner. The front hall and vestibule are to **Wainscot.** be wainscoted, as per detail, of clear black walnut with **Tank.** cherry panels. Make tank in attic 5 feet wide by 5 feet long aud 3 feet deep on inside of 1¾ inch planed pine plank with splined joints, to be lined by the plumber; the same to have a cover of matched and beaded pine flooring, battened on the under side, with rounded edges and hasp and pad-**Mantels** lock fastening. The carpenter is to set all mantels in the best manner, and case over for protection until the house is delivered, removing the casing only for painter's work and replacing afterward. The carpenter is to make mantels to all fire-places, as per details, and also shelves with brackets in chambers which have no fire-places, in the best manner, and to be of first-quality thoroughly seasoned stock to match the finish of rooms, and all to be well bolted and doweled **Shutters.** together. Solid paneled ⅞-inch inside shutters of wood to match finish of rooms for entire first and second stories, except kitchen wing; the same to be in six folds and the slats pivoted in center folds. Kitchen wiug is to have 1⅜ inch venetian blinds with movable slats in panels. Furnish **Mosquito Nets.** mosquito nets to all outside doors and windows, except basement. Those for the windows to slide outside the sashes on beads put up for the purpose; those for the doors to be hung on the outside, with springs to keep them closed, and brass hook and staple fastening. All to be made in the best manner with frames of clear seasoned walnut ¾-inch thick, covered with suitable wire netting, and all to be varnished, fitted and marked complete by the carpenter, **Cutting & Trimming.** and neatly stored in a convenient place in the attic. Cut the floors for registers and hearths as may be required, and fit border neatly around, and put up grounds to receive plastering for varnished work. Assist other workmen employed in the building, furnish patterns for bays, lintels and leave the buildiug clean on completion.





"WILLINGLY."

SPECIFICATION

Of the Materials and Work Required for Building a Two-Story Frame Dwelling House for Mr. David Williams, to be Erected on his Estate, Situated on the Northwesterly Corner of Belmont Avenue and Turnover Park, Dirigo, Maine. To be Built According to the Accompanying Drawings, and the Following Conditions Prepared Therefor, and Full-size Drawings to be Prepared as Implied by Present Drawings, and to be Under the Superintendence of the Arehitect.

The several drawings referred to herein, are as follows, and consist of: Plan of lot with grades, &c.; plan of basement; plan of first floor; plan of second floor; plan of third floor; plan of roof; front elevation, east; north elevation; west elevation; south elevation; framing plaus for the above; full-size dctails; sectional and detail drawings.

Drawings.

The drawings (to work from) are made to a scale of 4 feet to the inch.

Details are full size or otherwise marked. Preference to be given to figured dimensions over scale in all cases, and the larger drawing to be used in case of discrepancy.

In case of difference between the drawings and this specification they are to be returned to this office for correction. No drawing to be copied or used elsewhere; as instruments of service they are the property of the architect, and must be returned to this office on the completion of tho building, before the final payment will be made.

No advantage to be taken of any manifest omission or discrepancy, and suggestions for the benefit of the building will be received at any time by the architects.

General Conditions.

These conditions to apply to all of the trades with equal force.

The owner will *not* furnish a thing unless distinctly so stated.

Tho contractor to provide all materials and labor necessary for the proper execution of the various portions of the work, and are to be the best of their respective kinds to be obtained in the market. All materials proposed to be used by him are at all times to be subject to inspection for approval or rejection, and all materials or workmanship of unsound or unfit character are to be immediately removed, or reconstructed to the satisfaction of the architect.

Should he introduce materials or work not in accordanco with this specification, they must be removed, if so ordered, at any time during the progress of the work.

Work. The works are to be executed in the best, most substantial and workmanlike manner, according to the true intent and meaning of these particulars, and the drawings referred to, which are intended to include everything necessary to the proper and entire finishing of the building, ready for occupancy, notwithstanding every item necessarily involved by these works is not particularly mentioned, and all the works to be delivered up when completed in a perfect and undamaged condition, without exception.

Public Ordinance. The contractor to be responsible for each and every violation of the public ordinances, and shall hold the owner harmless for any damage or expense arising therefrom, and at the completion of the works the contractor is to remove all rubbish and surplus materials from the premises.

Insurance. The owner will insure the building with "Builder's Risks" during the construction of the building, the sum to be increased from time to time as the work progresses. The contractor to pay two-fifths of such costs. In case of loss by fire, the owner is to retain an amouut of money equal to amounts paid to several contractors, the balance to be paid to the contractors in their respective proportions. The works to be then reconstructed, and the owner will then pay the amount retained by him for insurance received.

Closing in. The windows and doors are to be properly closed during the progress of the works, and outside doors kept locked during the night.

Smoking in or about the building *not* allowed, either in or out of working hours.

Spitting on finished floors strictly forbidden.

Privy. Build a privy on rear of lot as directed by architeet, for the use of all workmen employed in the construction of the house, the same to be removed by coutractor at completion of his work.

Prices. Where prices are given for the purpose of estimate, or selection of materials by the architect, the price is *net* cost, and does *not* include any other expense, such as express, carting, or labor of putting in position.

No discount allowed on materials deliver at the building by architect.

Variations from prices given will be added to or deducted from contractor's estimate at final settlement.

Proposals. The right is reserved to reject any or all proposals.

Contracts. The work to be let in five distinct contracts, viz:

Part 1st. Stonemason's, page 206.
Part 2d. Carpenter's, page 207.
Part 3d. Painter's, page 209.
Part 4th. Plumber's, page 210.
Part 5th. Heating, page 210.

Time. The work to be commenced at once, and be completed in every particular, on or before the 20th day of December, 1882. The different trades to be governed accordingly, and forfeitures will be required in contract.

Description.

The building to be of wood, two stories high, covered with hip and gabled roofs. The two stories and the attic, with a portion of basement, to be finished as hereinafter specified.

The clear hights to be as follows:

Basement 8 feet 6 inches.
First story 10 feet 6 inches.
Second story 9 feet 6 inches.
Attic 9 feet.

All to be divided, subdivided, and built in exact accordance with the drawings and this specification.

PART FIRST.

Stone Mason. (See General Conditions.)

Loam. The loam to be removed from any place where grade is raised or lowered, and to be piled up on one side of lot, to be used on top in finishing grading by the mason.

Excavation. Excavate and remove earth to the required depth for cellar, as well as for footings of all walls, piers, posts, steps, chimneys, boilers or furnace, and to extend to firm and solid earth; in no case to be less than 4 feet below adjoining finished grade. Earth removed to be used as far

as necessary, and as directed in grading. Surplus dirt to be removed from the premises.

Mortar Wall. The portions of cellar wall below grade, also under latticed piazzas to be of stone mortar wall. The footing courses to project at least 8 inches outside of rest of wall.

The stone to be of large size, good shape, good bed and build, laid bonding, close and solid, with full joints of mortar, and good even wall-face where exposed, inside or outside.

Mortar. The mortar to consist of best quality of lime and cements to be obtained in the market. The sand to be coarse, sharp and free from loam or other damaging impurities. To be mixed as follows: One cask of cement to two of lime, and sufficient sand to form best quality of mortar, as directed. Cement not to be added until lime is slaked, and then only as wanted for use.

Footings. Furnish and lay footings of ample dimensions for piers, posts, chimneys, steps and boiler or furnace foundations. That for steps and boilers laid dry, the balance laid in cement mortar, well rammed to bearings.

Brick Wall. The exposed wall forming the underpinning, also for 6 inches below grade, to be of brick. The brick to be best hard-burned, the best selected for outside faces. To be thoroughly bonded as directed. The wall to have 2-inch vault or air-space, plastered on inner wall of vault, and smoothed.

The bricks to be laid in mortar, as before described, in the proportion of one of cement to three of lime, otherwise as before directed.

The outside course to be laid with red mortar, formed by mixing "Brandon red" with mortar for desired shade.

The inside and outside of wall to have joints neatly jointed. The outside to be properly cleaned down.

Paving. The entire surface of basement to have cement concrete floors. To be at least 2 inches thick, and composed of one of cement to two of gravel, troweled smooth throughout, and to ditch towards outside walls, forming a gutter next to wall.

Paving not to be put down until directed when building is most completed.

Drains. Build drains with best salt-glazed drain pipe of dimensions marked on plans, and connect with the cesspool and settling basin respectively. From these carry pipes to a Field's flush tank, arranged to distribute into agricultural tiles laid with open joints placed about 12 inches blow grade and nearly level.

To have about 300 feet of 3-inch tile, arranged with branches from a 4-inch main as directed.

All other pipes to be laid with joints perfectly tight, with best cement, well wiped out inside and laid with good bed and uniform pitch toward pool or basin.

Iron pipe to be laid through stone walls. Place 4-inch iron pipe outlets for roof conductors, 2 feet long, left 6 inches above finished grade. To be suitably ventilated as directed.

Cesspool & Settling Basin. Build cesspool and settling basin with hardest burnt brick in cement mortar, walls 8 inches thick, with bottom of inverted segment, plan to be circular, 3 feet 6 inches diameter for pool, and 3 feet diameter for basin. Covers of 4-inch bluestone, with rebated hole for 1¼-inch iron cover perforated.

Granite Window sills 4 x 8 inches, dressed on top surface, rough even split face. The bulkhead curb and steps, also door threshold and lintel to be 8 x 12 inches, six cut on top surface hammered on face.

To be of any good, even dark-colored stone.

Well. Dig a well on rear side of lot as directed. Curbing to be performed by mason if required. The well to be dug to a depth giving 5 feet of water during dry season. The sides to be formed by suitable stones, well laid and capped with 6-inch bluestone, with holes cut for windmill or other apparatus, as directed.

Blasting. Give price per cubic yard for blasting solid ledge, should it be required, to secure depth desired. The stone removed to become the property of contractor.

Extra. Give price per cubic yard for extra excavation (including removal), and price per perch for extra wall, rated at 25 cubic feet per perch, for work below depths indicated by drawings, the prices to include curbing, piling, or any other expense that may occur.

Brick Mason.

Brick. All brick to be hard burned, of good quality. The face of fire-places and chimney-tops to be laid with pressed brick with red mortar. The exposed walls of laundry to be faced with "wiped" brick, in red or black mortar, as directed.

Mortar. Mortar to be of best limes and cements obtainable in market, mixed in proportion of one cement to three lime, and sufficient clean, sharp sand to form best quality of mortar.

Cement to be added only as wanted for actual use.

Walls. Basement walls laid to under side of timbers of first story, to be plumb and straight, joints neatly jointed on both sides of all walls, after first floor is laid, fill up to same with brick on all outside walls.

Chimneys. Build chimneys to hights shown to be plastered on outside from ceiling of basement to roof boarding, inside of flues struck joints. Furnish and set thimbles and stoppers for all rooms as required. Furnace flue at least 12 inches below floor timbers.

Corbel out and around all thimbles at same time chimneys are laid, to face of stud, thimbles in all cases to reach from face of plastering to inside of flue.

Tops protected with beveled top bluestone, axed on edges, to be in one piece for each stack, with required holes cut through for each, set in cement. Ash doors at foot of each flue extending to cellar, set as brick are laid.

Fire Places. Turn hearth arches for fire-places, and form smoke flue directly over center of hearth, provide all necessary iron bars, bolts, ash-shute covers, soapstone dampers, &c. The backs, cheeks and jambs to have pressed brick, to be molded for angles at front, arch brick cut to pattern, all laid with fine joints to design rendered.

Tiles. Hearths to have tiles worth 40 cents per square foot, bedded in cement, and filled with sand.

Tiles for exposed chimney panels to be as per design, properly set.

Piers. Build brick piers of dimensions required, with 2-inch thick hardwood cap.

Centers Carpenter will furnish required centers for masons' use, also wood caps for brick piers.

Regist's Furnish and set two registers, one near ceiling of laundry and kitchen, to open and shut by wire cords, and suitably secured.

(See General Conditions.)

Plastering.

Work's requir'd The walls and ceilings of the two finished stories and of attic, and the ceiling of the basement are to be lathed and plastered. The walls of kitchen, pantry, china-closet, side hall and toilet and bath rooms, to have dado 3 feet high above floor; 4 feet for attic billiard room.

Lathing The above work to be plastered, to have sound spruce laths, set ⅜ inch apart, joints broken every five laths. To have five nailings on ceilings and four on walls. Lath for back plastering where dadoed for outside walls.

Plastering. The plastering throughout to be two-coat work, except basement ceiling to be one-coat-work well smoothed. The first to be of lime, sand and hair mortar—best materials—the second a skin-coat of lime and beach-sand putty, except kitchen, pantry, china-closet, side hall, toilet and bath rooms to have "soapstone" finish on walls. All to form the best quality of two-coat work.

The outside walls are to be plastered down to under floors, between grounds, which with back plastering to be one-coat work, smoothed.

Stucco Work. Run a light cornice for parlors, library, sitting and dining rooms, as per section, with cast plaster centers for each room worth $10 on an average. To be properly set and left with true lines and in perfect condition. Cornices to be worth 70 cents per foot.

Repairs Perform all patching, repairs, &c., to plastering after all other workmen are done, without extra cost to owner.

PART SECOND.

Slating. (See General Conditions.)

Paper. Lay one-ply best tarred paper under all slate or tin, well lapped.

Slating. The roofs of house, including porches and door heads, to be covered with best Brownville or Monsen (Maine) slate, to be 9 inches, or 10 x 14 inches, uniform in widths and thicknesses not to exceed 50 slate per foot high.

To be well secured with two nails to each slate, tinned or galvanized, and of best Swedish iron. Hips mitered.

Tinning The floors of balcony in front gable to be covered with best M. F. brand of tin, well secured, and soldered with rosin flux. No acid allowed.

Flashing. All hips, valleys, dormers, chimneys or other place requiring same, to be well flashed with 4-pound lead or 1-ounce zinc. The contractor for slating to be held responsible that he furnishes and applies amply sufficient flashing stock, and fitted as may be directed. All work to be warranted one year.

Woodwork. The finials, cresting and the walls of house, &c., are of wood and will be furnished by carpenter.

Carpentry.

Frame. All frames throughout to be the best of their respective kinds, sawn die-square and free from large or loose knots, shakes or other damaging imperfections, and framed in the best, most substantial and workmanlike manner, as indicated by drawings.

All frames not otherwise specified to be good quality of pine.

Sills, girders, headers, &c., &c., to be mortised, tenoned and oak-pinned together.

First-floor timbers gained into sills and to rest on walls full depths. The second story to rest on ledgers (notched ¾ inch), and spiked with 20d to studding; third-floor joists spiked to foot of rafters, as shown, collar beams the same.

Outside stud, 2 x 4; window studs and head and sills, 3 x 4; plates, 2 x 4 doubled; collar beams 1½ x 6 inch; ledgers, 1 x 4 inch. Joists doubled for trimmers, headers and under partitions.

Exposed portion of rafters forming cornice to be planed and cut as per details.

Porches &c. The porch and piazza frames to be of white pine, 2 x 7 joists and rafters; sills, 6 x 6; plates, 4 x 8; planed where exposed to view. Floor joists to be of good Canada stock, roofs of No. 3 Michigan, or equal, cut to pattern given.

Floor joists covered with three-ply best tarred paper before floor is laid.

Dimensions of frames will be figured as follows: First

and second floor timbers, 2 x 10 iuches; third-floor timbers, 2 x 9 inches; rafters, 2 x 8 inches; sills, 6 x 7 inches; corner posts 4 x 6 inches; hips, 3 x 10 inches, and valleys, 3 x 9 inches; aud all frames to be set 16 inches on centers, nnless shown or mentioned to the contrary.

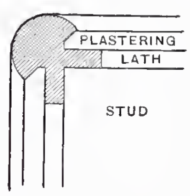
Parti-tions. Partition of 2 x 4 and 2 x 3 as shown, and set 12 inches on centers, double-stndded each side of openings. Headers 5 inches high.

Partitions to have 2-inch sill and plates as required, and partitions directly over another below, to run down between joists and rest on plate below. Partitions crossing floor joists overhead to be braced over doors. All angles to be made solid, and priucipal partitions of the two finished stories to be bridged with same stuff as partitions once in their hights.

All partitions requiring to be made self-supporting.

Bridg-ing. All floors to be bridged as shown, with 1 x 2½ inch strips neatly fitted and well secured with 10ds.

Furring The ceilings of the two finished stories, and of attic and basement, to be furred 12 inches on centers, with sprnce strips ⅞ x 2½ iuches, well straightened and nailed with 10ds; also cut in fnrrings for mantels, dado and back plastering, making tight between boarding and plastering both above and below, to prevent heat from rising.



Plaster Bead. Place ¾-inch patent plaster bead on all external angles.

Grnds. Place ¾-inch grounds for all finish, to be set 5 inches above floors for all (except where dadoed, which will be 2-10ths and 3-10ths inches high) base, and on ontside walls to have an additional ground near under floor.

All to be well straightened and secured.

Rough Board. The under floors of first and second stories, the wal's and roofs, to be covered with matched pine stock boards, thoroughly seasoned and laid dry, joints well broken, and to be thoroughly nailed to every bearing with 9ds. The nnder floors of secoud story to be cut in between studding to prevent heat rising.

Piazzas, &c. The nnder side of main cornice, as well as piazza cornices, are to have roof boards selected, or else faced with ½-inch thick beaded pine sheathing, nailed on top of rafters, in recess cut for same.

Sheath-ing Felt. Place heavy rosin-sized, linen-fibre, sheathing paper under all finish, clapboards, &c., with an additional thickness of tarred paper under window or door-casings, corner boards, &c., where there is any liability of shrinkage, and to be placed outside of the sheathing paper.

Outside Finish. All outside finish, including water table, corner boards, window finish, cornices, piazzas, balconies, &c., to be made of No. 2 Michigau pine, well seasoned and dry, and wrought out in forms shown, and set up in best manner, exposed joints put together iu white lead, ends of rafters above gutters to have strips of lead nailed to them, well lapped over edge of gutter. Joints in gutter to have lead strips sunk in white lead and secured with copper tacks. All as per details.

Shingl's *Walls* of house, dormers, window-heads, &c., so shown to have first-quality pine or cedar shingles of uniform widths (4 inches to 6 inches wide), laid about 6 inches to weather, with joint in center of course below.

Lower ends trimmed to pattern given.

The shingles to be dipped in paint before laid, and allowed to dry.

Clap-boards. All outside walls, not otherwise provided for, to have best pine clapboards, 6 inches wide, laid 4 inches to weather, and well nailed about 8 inches apart; to be laid straight, with square joints and level lines, all planed.

Sheath-ing. The ceilings of piazzas, &c., to have ¾-inch beaded white-pine sheathing, blind-nailed and continuous lengths, no two joiuts at same place.

Panels. All panels to be as per details. Carvings clean cut, with all lines well defined.

Gutters To be of clear Michigan stock, thoroughly seasoned, and have two coats of linseed oil before put up.

Con-ductors Place 3-inch hole expansive galvanized-iron conductors, as shown or directed; goosenecks of 2½-inch hole lead pipe, or may use ornamental galvanized iron for same.

Conductors suitably secured and connected with gutters and drains.

Centers. &c. Furnish all centers, patterns of all kinds, and door and window frames for mason's use, also hardwood caps for piers, 2 inches thick.

Win-dows. Window-frames of ¾-inch Southern pine, for stiles and parting beads, remainder of white pine as per outside finish. Frames for two-sash windows to have four axle pulleys with bronze face; not to be set until after cellar is dry. Each *stile* to have pocket neatly cut in and secured with screws. Cellar-frames to be box pattern, with 1¼ x 1¼ inch brick mold outside. Each frame to be fitted with the required sash as to number or thickuess (1¾ inch), hung with best approved sash-cord and round-iron counterweights. Center sash-fasts to be worth $6 per dozen on an average.

Window-bands secured with round-head screws, bronze finish, for two stories.

Sash-lifts and locks to be of approved patterns. For glass see page 209.

Blinds. Windows so indicated on drawings to have outside blinds, 1¼-inch thick, *clear* pine, rebated and beaded stiles, half-rolling slats, hung with loose-joint butts, and trimmed with best approved blind fastenings. Attic to have no blinds.

Shutt'rs Windows so designated to have ⅞-inch inside shutters or blinds, of same wood as finish of room. To have half-rolling slats, back flap cut apart at meeting-rail of sash, hung with suitable bntts and fitted with shutter-bars to correspond with trimmings for doors of room. Where so shown to have furred boxing panel, as per drawings, extending to floor. To be of same wood as room finish. (See below).

Doors. Outside first-story door frames of 1¾-inch thick pine stock, veneered with hard wood (see margin for inside finish) inside. To have thresholds of 1¾-inch Southern pine.

Doors to be of 2¼-inch thick stock finished. Cores of white pine, veneered with hard wood inside. Transom for side entrance to be hung with approved trausom sash-fastenings, operated from floor. Front-door transom sash to be stationary.

The vestibule and all inside doors above basement to have frames 1⅜-inch pine stock, veneered with hard wood where such wood forms finish of room.

Canada stock *well* seasoned may be used under veueer; *pine* jambs to be of *clear* kiln-dried stock.

Doors of thickness and size shown on margiu, and built as per details, to be thoroughly kiln-dried.

Thresholds to be of ⅞-inch cherry.

Place base knobs where required.

(See page 209 for glass).

Base-ment Doors. The outside-basemeut door frame to be 2¾ inches thick, properly secured to stone sill and to walls.

The inside frames to be 1¾-inch thick pine stock, to extend into cement floors, and have no thresholds, except in laundry. Doors as per details. Doors so marked to have trausom sash or glass panels.

Trim-mings. The front and vestibule doors to have trimmings worth $20 per pair. The remaining doors, not otherwise provided for, to have trimmings worth $2.30 per door on an average, exclusive of any labors (see page 206).

Doors so marked on plans to have transom sash, hung with suitable fixtures.

Sliding doors trimmed with best fixture in the market, as approved.

Top Floors. The kitchen, pantry and china-closet, and the side entrance, first story, and billiard-room of attic story to have thoroughly kiln-dried birch or maple floor boards, of narrow widths—not over 3 inches wide—worked, matched and mill-planed ⅞ inch thick, laid in continuous lengths, no two joints at same place, set close, blind-nailed with steel 8d nails, and haud-smoothed.

The floors (above mentioned) not to be laid until all other work is nearly completed, and then *must* be kept covered with heavy paper and boards until all is swept out ready for painters.

The remaining top floors of first aud second stories to have sqnare-edged pine floor boards, third quality, well seasoned and dry, joints properly broken and well nailed with 10ds.

Place one ply of sheathing paper between top and under floors of first story.

Attic Floor. The attic floor to consist of but one thickness (except billiard-room, see below,) of thoroughly seasoned and matched white pine, best quality and of narrow widths laid close and thoroughly nailed to every bearing. To be well fitted between rafters, &c., as directed.

Porch & Piazza Floors. Lay porch and piazza floors of selected rift Southern pine, square edged and laid with ⅛-inch open joints, laid on tarred paper (see page 207), molding under edges.

Inside Finish. The inside finish to be thoroughly kiln-dried, hand-smoothed, and sandpapered before set up. The parlor and parlor-chamber to be finished in walnut, front hall, (first and second-stories,) library and bathroom in cherry. The kitchen, pantries, and rear hall in ash and chestnut. The dining-room and the remaiuing portions of second story to be finished in butternut. All as per details. Billiard-room finished in chestnut, balance of attic in white pine.

Dado. The kitchen and its adjuncts, including toilet of first story and the bathroom of second story, are to be sheathed 3 feet high above floors, put on vertically and blind-nailed. The toilet and bathroom to have molded base and cap, with panels for bathroom. The kitchen, &c., to have molded cap only. The dining-room to have a 3½ x ½ inch chair rail put on over plastering.

Pantry. Fit up pantries with shelves, drawers, closets, &c., as shown and directed. Shelves to have dish-grooves near back edge. Drawers to have overlap fronts, and bronzed iron drawer-pulls.

Closets to be fitted with beaded sheathing fronts, and 1⅛-iuch thick doors, framed and paneled, molded rails and chamfered stiles, and fitted with brass butts and screws and approved door fastenings.

Shelves may be of butteruut or pine. Fit around china sink, as directed.

Refrig-erator. Owner will furnish and deliver a refrigerator for contractor to set up.

Kitchen Fit np around kitchen sink with woodwork. Form closet of beaded sheathing, doors of same, cleated, hung and trimmed in neat and substantial manuer. Build set of drawers under dripboard. Place a 12-inch shelf under sink, also a 15-inch backboard to sink and drip, and place eight small brass hooks on cleat above same.

Bath Room. Fit up bathroom with water-closet and bath-tub as shown, front and end of tub paneled, rails molded, stiles chamfered, panels framed. Water-closet riser pauelcd same, aud made movable for repairs; seat and cover properly built (cover

framed) and hung with brass butts and screws, with an additional children's seat, made movable, and with recess for same when not in use. Build paper drawer.

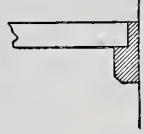
Place a strip with large hooks on one side; also a hanging closet with shelves and drawers properly trimmed.

Wash Stands. The wash-stands are to be finished in the same kind of wood as finish of room (see page 208); fitted with doors, hung and trimmed, and to have drawers where practicable fitted with trimmings to correspond with door furniture of same room. Keys, escutcheons and drawer-pulls.

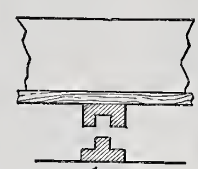
Bottoms of drawer of butternut.

Toilet The toilet under stair-landings on first story to have water-closet and wash-stand similar to those above described, also place a cleat with six double hooks as directed.

Closets. Fit up closets with shelves, about 10 inches wide, and four tiers high; or a shelf and cleats with coat and hat hooks on three sides of closet, where practicable. Cleats to be rebated, as per sketch.



Place a set of four drawers to each chamber closet where so marked, also a set of three-deep drawers for linen closets, all overlap fronts, and trimmed with bronzed iron drawer-pulls, all fitted with center-grooved runs, as per margin.



STATIONARY STRIP

Tank. Build and set up a storage tank above attic on suitable bearings, extended to cellar, to be 6 x 10 x 4 feet below the overflow, which point is 6 inches below top edge of tank, and built of 2½-inch pine plank and oak standards (four each side), and secured by eight iron rods with washers, nuts, &c.; rods ⅝-inch iron.

Tank is to be lined with copper (see page 210). Fit with cover, hinged, raised slightly, and counterweights.

Cistern. Build a cistern to supply the range boiler, to be 3–0 x 2–6 x 3–0 deep, of 1¾-inch thick pine, fitted with movable cover to keep out dust, &c. Cistern to be lined with copper (see page 210).

Stairs. Construct the several flights as indicated by drawings. Stringers to be 2 x 14 inch pine plank, about 12 inches apart, and securely fitted. All work to be first-class, and thoroughly glued up as required.

The principal staircase to have ornamental buttresses, as shown, risers and treads grooved and tongued, and connected with skirtings by same.

Posts square and turned, carved as per details. Rail of pattern shown, balustrade as per details, balusters housed into hand-rail. All carvings to be clean cut, with sharp angles and well-defined lines.

Front Stairs. Tiling in wainscoting to be set in perfect condition, as per design.

Back Stairs. The back stairs to be boxed with molded nosings.

To be built similar to front stairs, pertaining to method of construction.

To have 2¼ x 2 inch hand-rail on one side of stairway, secured with suitable stair-rail brackets. Steps to tank above attic story to be without risers, treads let in stringers.

Cellar Stairs. Similar to back stairs, but nosings not molded, treads of steps 1⅛-inch thick maple.

Steps. Build wooden steps to outside as per drawings, treads of 1⅜-inch maple, molded nosings, risers, &c., of white pine. Rails, posts, &c., of pine or white wood, all well secured to house by iron knees.

Coal Bins. Build two coal bins, one each for furnace and stove coal, to hold 15 and 8 tons respectively, built of 4 x 4 joists and matched pine or spruce boards. To be fitted with movable boards and slides as directed. Build a coke bin to hold 2 chaldrons.

Cold-air Box. Build two cold-air ducts, one from opposites of cellar of ample dimensions, each to be fitted with damper to regulate draft, and a small door to clean box out. Fit wire screen on frame over opening at outside, to exclude leaves, &c.

Pipes arranged to throw the current of air directly against a vessel holding water, thereby arresting dust, &c. All as directed.

Clothes Shute. Build a clothes shute from bath room in second story, next to main hall, and down through pantry closet into the receiver built in connection with laundry closet. Fit up suitable door in second and third stories to receive, and in basement to take out. To be built of pine sheathing, well put together.

Electric Bells. The outside doors, dining-room, library, dining-room and library chamber and bathroom to be connected with an annunciator, placed in kitchen, with an additional gong placed in front hall, connected with front doors.

All wires concealed. Pulls to correspond with door trimmings.

All of the apparatus to be first-class and fitted complete in every particular, and warranted for six months.

Cutting and Repairs Carpenter to perform all necessary cutting, fitting and repairs in connection with plumbing, heating, gas-fitting, &c., including runs, boxing, &c., for pipes. Portions of floors or finish necessary to be removed for repairs of plumbing to be secured with screws.

Batters. Furnish materials for batters, and a man to assist the engineer setting same.

Iron Work. See page 206.

Furnish and set iron grilles for front doors, and for cellar windows; also, all iron dogs, anchors, &c., required for door frames, or supporting partitions overhanging rooms, &c.

Sun Dial Properly construct a sun-dial where shown, plate of polished slate, suitably numerated; plane to be of burnished steel. All suitably secured and flashed.

Arches. Fur for and finish all arches, as per drawings for same.

Hdw. All hardware subject to selection or approval of owner and architect, and to be of neat and durable patterns. (See page 206. Prices.)

Cabinet Work.

Mantels Furnish and set six mantels, viz., one each for parlor library and dining-room and their respective chambers, finished in same kind of wood as the finish of room, (see page 208,) selected with reference to evenness of texture and color, put together in best manner, glued and blocked. Carvings to be clean cut, all lines well defined.

Mirrors to be of French plate, beveled edge, and carefully set.

Tiles to be properly set and secured.

Furnish all iron anchors required for brick mason to set, and all, when completed, to be finished in every particular (see page 207). All to be as per details and as directed [as implied by present drawings]. The library and library-chamber mantels not to exceed in finish or cost that for dining-room and its chamber.

(For finishing see below)

Painting.

Materials. All materials to be the very best of their respective kinds obtainable in the market, and all work to be first-class in all respects.

All damage to paint from wind or rain to be at risk of contractor, and when delivered up to be completed in a perfect condition and no exceptions.

Outside woodwork to be primed within two days after it is put on.

Shellac. All painted woodwork to have knots, pitch, stains or other imperfections of lumber shellaced before painting.

Putty. All nail-holes, cracks, &c., neatly and thoroughly puttied with whiting and white-lead putty.

Outside.

Woodwork. All outside woodwork, including blinds, cellar windows, frames and sash, porches, dormers, &c., meaning any and all woodwork, to receive three coats of paint of either pure lead and linseed oil or pure colors ground in oil, of such tints as directed.

The finish to be of a darker shade than body walls, and are to be painted solid back to clapboards or shingles.

Colors to be mixed as directed, and not to be applied, until approved of.

Roofs. The roofs are of slate, but crestings are of wood and are included in above.

Tin, &c. The roof bay window (forming the floor of front gable balcony) to have two coats of mineral paint, also the same for galvanized iron conductors, which will have an extra coat of lead paint as directed.

Sash. The outside of sash to have three coats of paint, as selected.

The sash are to be stained cherry red, before glazing, rebates included.

Sash Runs & Floors. The sash runs and porch floors to have two coats of linseed oil, applied as soon as frames are set or floors laid.

Inside.

Hard Wood. The cherry finish to have a coat of spirits and oil (two-fifths spirits and three-fifths oil), instead of filling.

Remaining hard wood to be well filled with Wheeler's patent wood filler, as directed by manufacturer's circular.

All to receive four coats of hard-oil finish. Each of the first two to be lightly rubbed with fine sandpaper, and the third and fourth to be rubbed to a smooth surface for all portions, and the parlor, library, dining-room, parlor chamber, halls (first and second floors) and bathrooms to be rubbed with pumice and rotten stone in oil to a fine polish.

The mantels (see above) are included in the above. For inside finish see page 208, and the following pages for detailed finish.

Sash. Inside of sash to be drawn three coats of hard-oil finish.

Hard Wood Floors. The hardwood floors (see page 208) to have three coats of hard-oil finish, first and second lightly rubbed, and third coat rubbed to good smooth surface.

Closet Floors. All closet floors to have three coats of lead paint; also back, cellar and attic stairways.

Pipes. All exposed waste or supply pipes to be painted or bronzed as directed.

Regist's Bronze or paint, as desired, all registers throughout, of such shade as selected.

Pine. Pine finish to have two coats of shellac and one of varnish. (See page 208).

Glazing.

Plate. All windows of first and second stories, excepting rooms back of principal staircase, are to have French plate glass.

No. 1. The remaining windows of first and second story to be glazed with No. 1 double thick. The attic windows of billiard-room of No. 1 single thick.

No. 2. Remaining glass of attic and cellar to be No. 2 single thick. All German.

Ground. The windows of toilet-room, first story, to have double-thick gronnd glass.

Outside Doors. The outside and vestibule doors to have plain and sta'ned glass, as per designs, set in lead and secured in first-class manner.

Hall windows over stair-landing to have stained glass set in lead, for which allow $100, ready to set in wood sash.

Glazing All plate glass properly tacked and bradded, remaining glass pointed thoronghly, stained glass secured with beads. All properly set in pntty bed, bradded and pnttied in most perfect manner. Glazier to see that all sash are square when glazed, imperfect sash to have glass removed and re-glazed at his expense.

Completion. All glass to be delivered up when building is completed in a clean and perfect condition in all respects.

Paint spots or other stains to be removed by painter from all glass, slate, soapstone or hardware.

Heating.

Furn'ce Furnish and set the largest size of   furnace.

To have all necessary grates, dampers, doors, pans, &c., essential to the proper working, and when completed to be satisfactory.

Pipes. Connect with rooms as shown, with extra heavy piping of reqnired sizes, with a damper to each placed close to furnace. All pipes passing above first floors are to have an extra casing with at least ½ inch air-space all around, and stayed.

All pipes kept at least 1 inch from woodwork, and have tin or zinc covering for reqnired places.

Regist's Place Tuttle & Bailey Mfg. Co.'s registers, of tho reqnired size for each outlet, with wire or gauze netting in same. To be set in a soapstone border and secnred in good shape.

Air-Duct. The portion of air-duct next to furnace, 10 feet, to have galvanized iron instead of wood, with damper.

Arrange a sheet-iron basin to hold water for arresting dnst, &c.

Gas Supply.

Gas Machine. Do all required excavation for setting machine and for pipe connections with honse.

Machine to be of "Springfield" pattern, fitted np and left in perfect working condition, and warranted for three years.

Piping. From the reservoir to the house, and thronghout the house from cellar to attic, pipe with best qnality of wrought-iron gas pipe. Fit up ontlets where reqnired or directed.

Work to be well done and thoroughly tested. Pipes to be of ample size. No fixtures required.

Plumbing.

Supply. Properly set np a windmill of approved make and connect with the "Hartford Automatic Pump;" set in well and run a 1½-inch iron pipe to tank in attic of house, properly arranged with stop and waste to drain into well when so required. Fit np an indicator connection with attic tank.

The frame for windmill to be sufficiently strong and thoroughly secured; to have suitable stairways or ladders.

Tank. The tank in attic is of wood, fnrnished by carpenter (see page 209), and 6 feet x 10 feet x 4½ feet inside measurements, lined with 16-ounce tinned copper.

The overflow to be 6 inches below the top edge of tank, and arranged to overflow into cistern supplying water-closets, or on to roof at pleasure by means of stop-cocks. Supply the cistern for range boiler, and the several fixtures as hereinafter provided, also to a basin for air-ducts in cellar.

Cistern. Line tho cistern supplying range boiler with 16-ounce tinned copper, and properly fit with copper ball and ball-cock. Overflow pipe of 1¼-inch lead pipe wasting into bath-tnb.

Range Boiler. Range boiler of tinned copper of 40 gallons capacity, to weigh 70 pounds, set on a Lockwood boiler-stand; to be supplied by ¾-inch lead pipe from cistern; properly connect with kitchen range by brass pipe with suitable conplings; range and fire front fnrnished by proprietors.

Place cock in sediment pipe, and fit with hose coupling in cellar, so as to draw off sediment in pail.

Sink. Fit up a 4-foot soapstone sink in kitchen, with countersunk drip board at one end; back of sink and drip to be of soapstone. All to be polished, and set in first-class manner.

Strainer to be of brass and approved pattern.

Wash Trays. Set a two-part soapstone wash-tray in laundry, with soap dish and brass plug and chains.

Pantry Sink. Set np a china sink in pantry, 16 x 20 inches, of approved pattern.

Wash Stands. Fit up wash-stands where shown, one on first floor and three on second floor—fonr in all. To have 14-inch marbled wash-basins with overflows.

To have countersunk marble tops, and with 14-inch backs and sides as required. Best Italian marble, with molded edges. Set in best manner.

Bath Tub. Bath-tub of 14-ounce tinned copper, and 5 feet long. To have most approved method of snpply and waste. To supply one end near bottom of tnb with fan, and the waste to operate above tub.

Water Closets. The two water-closets (one on first and one on second floor) to be of the "Hartford" glass-lined pattern properly set. To have ventilating pipe, as hereinafter directed. To have a urinal safe, and separate (one for the two closets) snpply cistern-waste preventer.

Iron Supply Pipes. All iron snpply to be best enameled wronght-iron pipe, and none to be less than ¾-inch. To have 1½-inch from pump to attic tank, and a ¾-inch branch rnnning to wash-trays, with stop and waste near main; also a 1-inch branch to two sill-cocks, as directed, with stops and wastes in cellar. To have brass pipe through cellar walls for sill-cocks.

Lead Supply Pipe. All snpply pipes above the cellar to be of lead pipe, as well as connection of hot and cold water for laundry.

Pipes to weigh per foot as follows:

⅝-inch	pipe to weigh	2½	ponnds	per foot.
¾-inch	" "	3	"	"
1-inch	" "	4	"	"
1¼-inch	" "	5	"	"

The wash-stands, bath-tubs, sinks and wash-trays are to be supplied with hot and cold water throngh ⅝-inch pipe.

Water-closets snpplied by ¾-inch pipe, with cold water only from waste-preventing cistern of approved pattern, with an antomatic snpply; ball and ball-cock.

The circulating pipe from range boiler to have vent over its cistern in attic.

Brass Pipe. Exposed supply pipe in kitchen to be tin-lined brass pipe, nickel-plated.

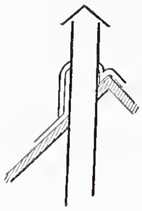
Lead Waste Pipe. Lead waste pipes to be as follows:

1¼-inch	pipe to weigh	2½	ponnds	per foot.
1½-inch	" "	3	"	"

The wash-basins and china sink to have 1¼-inch lead wastes, with lead S traps, with brass screw beneath.

The bath-tub, kitchen sink and the wash-trays to have 1½-inch lead waste pipes, with S (lead) traps, with brass screw beneath.

Iron Waste Pipes. The main waste from bathroom to drain (where it enters cellar) is of 4-inch cast-iron pipe, and extended fnll size above roof and capped 16 inches above roof ridge.



Solder a collar to pipe where passing roof; also furnish another for roofers' nse, and warrant perfectly tight. (See sketch.)

Water-closets to have 4-inch cast-iron traps.

First-story closet to have 4-inch waste connected with main waste in cellar; continued 3 inches above, and take basin waste and continne throngh roof, treated same as 4-inch pipe. The two basins adjoining are to have 2-inch iron vertical waste-pipe, to be increased to 3 inch below first floor and connected with 4-inch pipe. Connect with 3-inch vent above.

Each fixtnre is to be ventilated at npper bend of trap with 1¼-inch for all except water-closets, which are to have 1½-inch lead pipe, connected with a 3-inch iron ventilating pipe, which is to be connected with main waste-pipes somewhere above upper fixtnre. All connections to be made with Y branches, and all fixtnres are to enter especial Y branches, and must not enter other traps, but below them. All joints in iron waste-pipes to be made with caulked oakum and molten lead well canlked; lead filling not less than 1 inch thick. Lead pipes entering iron pipes to have brass ferules soldered to them, and canlked as for iron pipes. All pipes properly supported, stayed and braced. Joints in lead pipes to have full wiped joints.

Cocks. All cocks to be compression; basin and sinks to be ⅝-inch nickel-plated bibb cocks, with hose strainer for kitchen sink. Water-closet pnlls nickel-plated. Laundry cocks ⅝-inch polished brass.

Chains, chain stays and plng (rnbber end) to be nickel-plated; also bath-tnb fixtnres. The lanndry, bath-room and chambers are to have stop and wastes suitably arranged so as to drain off from either.

Safes. Place safes of 4-ponnd lead nnder the wash-stands, bath-tub and water-closet of second story, to turn np 2 inches all around, and have 1¼-inch lead waste extending to cellar, with a strainer at safe end and brass hinged flaps at cellar end.

Completion. Any cock or other fixtnre that is necessary to render the system complete and satisfactory is to be supplied, and the whole to bo satisfactorily tested, and to be a first-class job in every respect.

Employment for Winter Evenings.

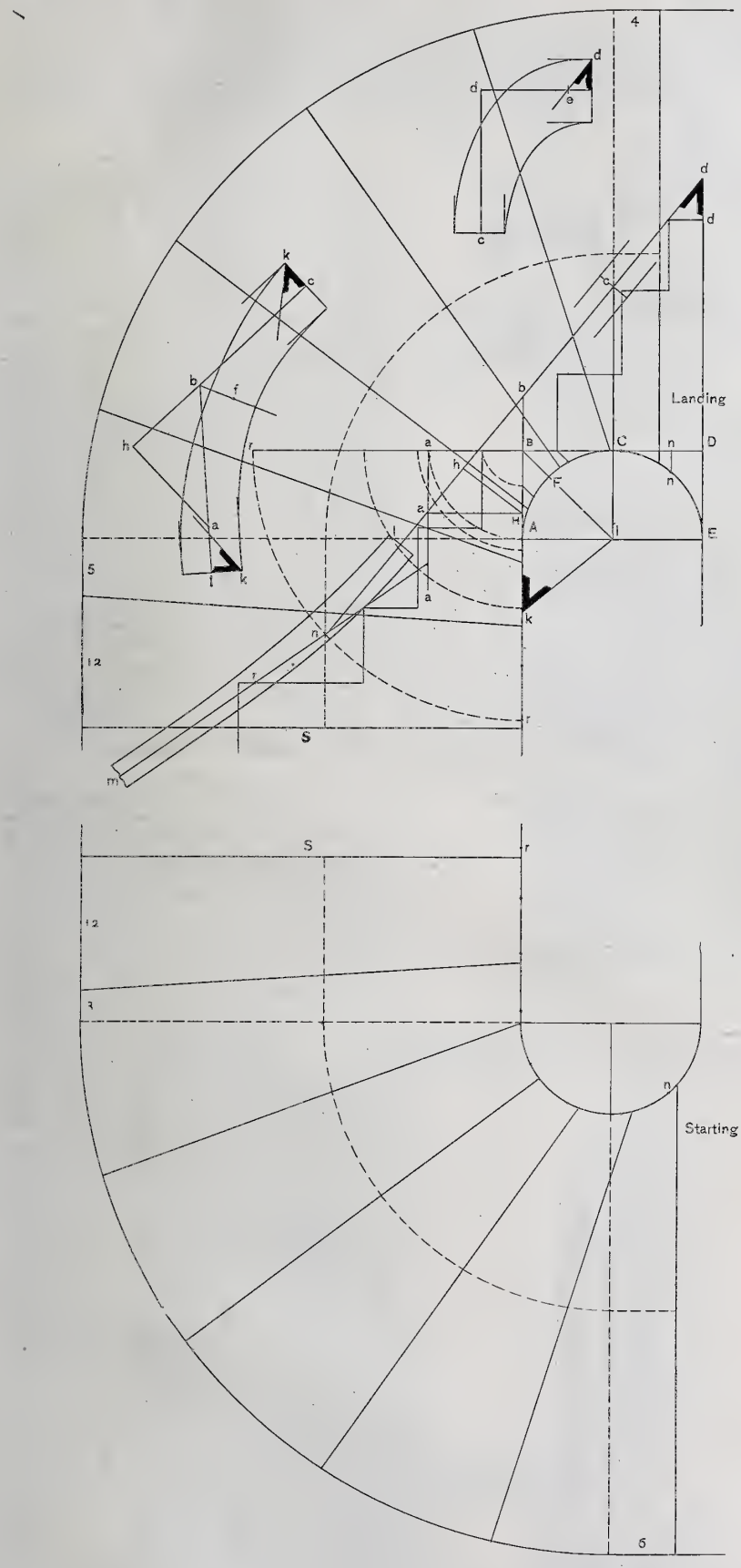
Now that the season of long evenings is at hand, ambitious young mechanics should be getting together their books and instruments in order to be ready to attend the annnal conrses of instruction that are given in many of the cities and towns. Those who are not so fortunate as to be sitnated where instruction of this kind can be obtained, can spend their time to good advantage in work of a similar character, with the assistance of some of the excellent text-books on mechanical and architectnral drawing which have been issned. The sncess of the evening drawing schools in various towns and cities of the conntry, is one of the most hopeful signs of the times. Where no public course is accessible, a few students can readily form a class among themselves, and at a slight expense secnre lasting and profitable resnlts. It generally happens that each one can give instrnction in some points to all the others. By this means each will become possessed of the knowledge that his fellows possess. By the assistance of books and mechanical and architectural journals, and, if practicable, by occasional supervision of some experienced draftsman or architect who is invited in to criticise the work, a drawing clnb composed of earnest young men will be enabled to make excellent progress. Such investments of timo and money never fail to retnrn large dividends.

Practical Stairbuilding.—XXII.

FLIGHT OF STAIRS WITH QUARTER CIRCLE WINDERS AT BOTH TOP AND BOTTOM.

In the diagram presented herewith the balusters are placed in the same manner at each end of the flight, so that the same patterns for the ramp and wreath pieces will answer for both top and bottom. The wall line represents the face of the wall string. The front line is the center line of the rail.

The first thing to do is to locate the baluster *n*. Place the point *n* so that the distance from *n* to the line E D shall be from 3 to 3½ inches. From *n* space off the other balusters, their distance apart being regulated according to the room allowed for the winders and straight steps. Draw the riser lines for the balusters *n n* as shown in the engraving. At S S draw the riser lines in their natural places with respect to the balusters and square across. About 18 inches from the center line of the rail draw a dotted line on which to measure the width of the treads. Divide the distance from S to S, being from the landing to the starting risers, into the required number of treads. Mark the places for the riser lines at the front string, making the winder next to the cylinder as wide as possible. Draw the line for the first straight step so that its width at the wall string will be an even number of inches, being in the case shown in the plate 12. Divide the remainder of the wall string which passes around the circle into equal parts. To find the circumference of the quarter-circle multiply the radius, which in this case is 48 inches, by 1.57. To this product add the 5 and 4 inches of straight wood. Divide this sum by the number of treads required. The quotient will be the width of a tread on the straight face of the stringer before it is bent. These widths on the drawings may be spaced off with the compasses. From the points thus established draw the riser lines to the points on the front stringer.



A Flight of Stairs with Quarter Circle Winders at both Top and Bottom.

To plan the rail pieces, draw the tangent lines A B, B C, C D and D E. Also draw A E and I C. Draw *n n* parallel to E D. Draw I B. Transfer the short balusters on the curved line A C to the tangents A B and B C respectively, by drawing lines parallel with I B. Produce C B to *r*, and by the dotted arcs shown in the engraving transfer the point A and the short balusters found on the line B A *r* over to the line C B *r*. Beginning with the level line through B draw an elevation on the short balusters as shown. Draw the perpendicular D *d d* making *d d* equal to half a riser. From *d* draw the pitch line *d n* as near as possible to suit the short balusters. At *n* this line meets the regular pitch line of the straight part which passes through *r*, the short baluster. The real riser line is here shown just at the left of *r*. Produce A B to *b* and draw the other perpendiculars *a a* and C *c*. From the point *a* where the pitch line crosses the perpendicular *a a* draw the level line *a* H. From H draw H *h* at right angles with the pitch line. Take A *k* equal to H *h* and draw the bevel line *k* I.

To draw the face pattern for the first wreath-piece draw the line *c b h* equal to *c b h* of the general diagram. At right angles with *c h* draw *h a* equal to the bevel line *k* I. Through *a* draw *b a l*; the distance *a l* is added for straight wood. It corresponds with *a l* on the general plan. Bisect the angle at *b* by the line *b f*. Make *b f* equal to B F. At *a* and *c* make the pattern about one-fourth wider than the rail. At *f* make it only slightly wider than the rail. Draw the curved lines in the usual manner, then *k* will be the bevel for both ends of the piece.

To draw the pattern for the top wreath-piece draw *d e* equal to D E of the general plan, and add 2 inches for straight wood. At right angles with *e d* draw *d c* equal to *d c*. At *e* make the pattern about one-fourth wider than the rail, and at *c* only a little wider than the rail. Draw the inside and the outside curves in the usual manner. The outside curve should be made a little full. At *c* there is no twist. At the top end *d* is the plumb bevel.

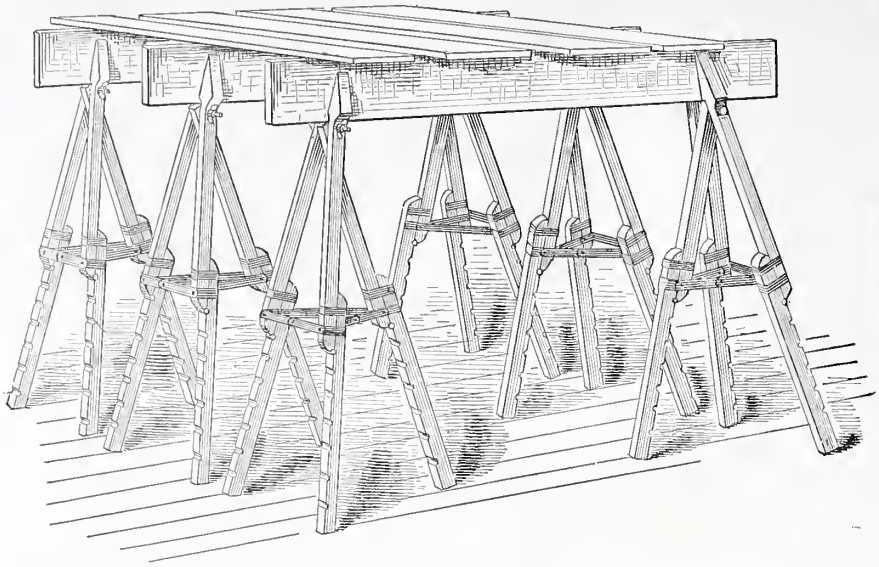
The same twists and ramp are used at the bottom end of the stairs, only they are turned bottom up. The place of the short balusters, *r r*, which is the same in the pattern, should be marked on the ramp pattern for convenience in taking the length of the straight rail. In the elevation it will be seen that two of the short baulsters will need to be extra long to reach the rail. The two corresponding balusters at the bottom of the flight will be just so much shorter than the usual hight.

There are two much-needed inventions in connection with paper. One is a preparation for making it soft and leather like, in other words, giving us a leather paper without necessarily attempting to give it a leather-like surface, and the other is a method for stiffening paper so that it shall approximately have the same stiffness as a sheet of wood of equal thickness. It would then have the additional advantage of being without a grain, and not liable to split. Not long since, a very valuable improvement in treating paper was introduced, and a cheap and remarkably good leather-like substance was prepared from paper pulp. Unfortunately, the inventor found more profitable employment, and if we are rightly informed, the invention has been practically abandoned, at least the leather paper is not now in the market. This is a subject that may well engage the attention of inventors. The importance of the improvements suggested can hardly be overestimated.

NOVELTIES.

Portable Adjustable Scaffold.

The convenience to builders, painters, paper-hangers and others of an adjustable, portable scaffold is too apparent to need special mention in this connection. Mr. J. Gorman, of Elizabeth, New Jersey, has perfected a device of this kind, some idea of which may be gained from an inspection of the accompanying engravings. Fig. 1 shows a number of bearings placed as they would be used by a plasterer or painter. Fig. 2 shows a single bearing partly opened, with a plank set in the jaws, over which is placed the saddle bracket shown in Fig. 3 of the engravings, which adapts the scaffolding for use with a single board. Fig. 4 shows one of the bearings folded up ready for transportation. The means by which adjustment with reference to the hight is secured, is clearly shown in Fig. 2. The two parts of which each bearing is composed are held together by bands, one of which is fastened to each of the two pieces. The lower end of the upper piece is provided with a spring, which is attached to a round piece of wood which it forces into the notches provided for the purpose on the lower half of the leg. Accordingly, in extending the legs, no impediment is encountered, but the moment that the two sections are forced together, as by placing a weight on the top of the scaffold, the piece of wood attached to the end of the spring engages with the notch in such a manner as to hold the upper piece in any desired position. The strain upon the legs is such that the clamps or straps themselves would be sufficient for all ordinary purposes, so that very little, if any, strain comes upon the spring. The manner of packing or folding the legs is clearly shown in Fig. 4, in which they occupy the smallest possible amount of space. When in this position, to open it is only necessary to push out the middle leg to the full length of the brace, then to push out the two side legs. Closing is accomplished in a similar manner. The two outside legs are first drawn in, and then the middle one. By reference to Figs. 1 and 2, it will be seen that the connecting braces between the three legs are hinged in such a manner as to permit of folding. It would seem that Mr. Gorman, in this scaffold, has obtained maximum strength with a minimum of material, and at the same time has provided something which, on account of its adjustibility and convenience for transportation, would fill a want generally experienced by builders, plasterers, painters and others.



Novelties.—Fig. 1.—General View of Gorman's Portable Adjustable Scaffold in Use.

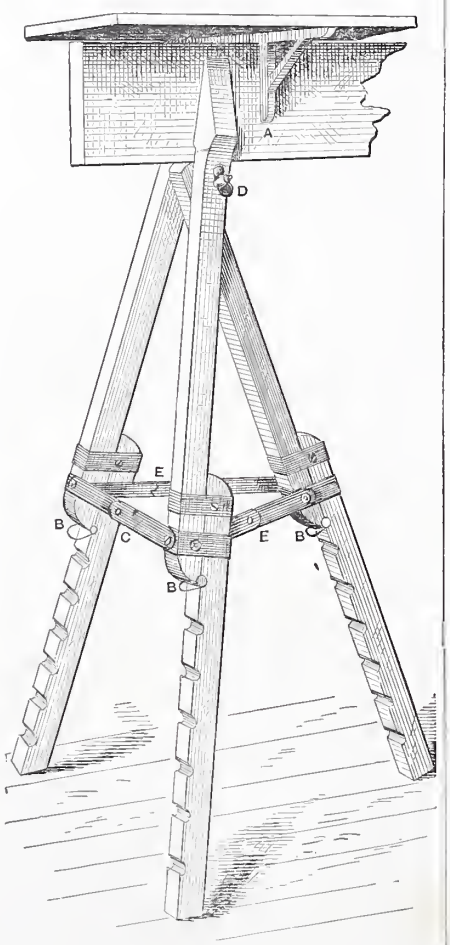


Fig. 2.—A Single Bearing, showing the Use of the Saddle Bracket Illustrated in the next Figure, by means of which a Single Pair of Supports may be Used.

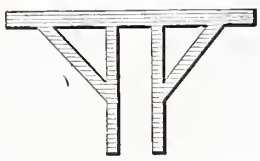


Fig. 3.—Bracket Bearing, the Use of which is shown in the Previous Illustration.

Fig. 4.—One of the Bearings Folded Up for Transportation.

The Hidden Door Knobs.

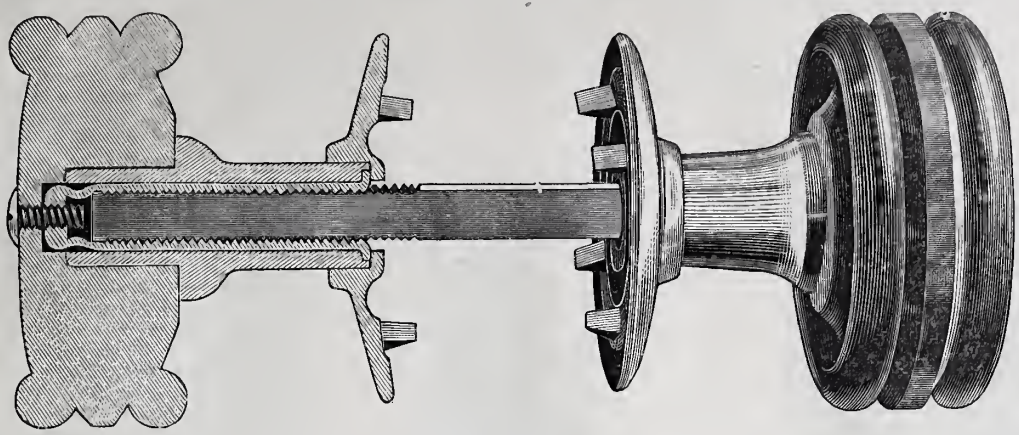
An article of special interest to all architects and builders who admire handsome door furniture is shown in Fig. 5. The adjustment by which the knobs are accommodated to doors of different thicknesses is of special value. The mechanical means by which this is accomplished is clearly shown in the engraving. The steel yoke, Fig. 6, is provided, in which a screw passing through the center of one knob engages. The spindle is headed at one end, and is fixed in the shank of the knob. The adjustable end of the spindle is notched, corresponding to the notching inside of the steel yoke. By this means the spindle is adjusted very accurately to the roses, which are first put in place, while the screw above mentioned fastens the loose knob in place. The special advantages to which the manufacturers, the Union Door Knob Company, of Detroit, Michigan, direct attention are as follows: Great strength, easy adjustment to thickness of door, quickness of application, absence of screws in the necks for securing knobs to the spindle, absence of screws in the roses, absence of adjusting washers, durability and simplicity, together with strength.

Boiler Circulation.

How and why water circulates in an ordinary range boiler, is one of the puzzles which even those who have had much to do with such boilers often find themselves unable to satisfactorily explain. The first and simplest way of gaining a clear idea of the matter is to take a couple of glass tubes, connect them at the bottom by 3 or 4 inches of rubber tubing and fill both of them with hot water within a couple of inches of the top. If, now, a piece of ice or snow be applied to one of the tubes, while the rubber tube is pinched so as to prevent the passage of water, it will be found after the tube has become cold that the water will no longer stand at the same level in the tubes, and that the cold water supports a column of hot water longer than itself. In other words, the cold water, bulk for bulk, is heavier than the hot water and pushes it up. It is this difference in weight between hot and cold water that gives us the ability to keep up a circulation in a range boiler. The greater the length of the two tubes the greater the difference of level and the more power will there be to maintain a circulation. If from a barrel or tub we carry pipes out top and bottom, and unite them so that when the tub is full water may pass from the bottom out through the tube and in at the top, we can establish a continuous circulation by simply heating the tube. The cold water, then, in the barrel being heavier than an equal amount of hot water in the tube, presses the hot water up and forces its way into the bottom of the pipe. The hot water, of course, rises to the surface and spreads out in a thin layer. If the heat is kept up the whole of the water in the tube would gradually be heated. This is precisely what we do in range boilers.

Fig. 7 represents the common form of boiler used, with its connections set in place beside the range. Fig. 8 is a section of the same, in which K is the water-back, as it is called. This water-back consists of a cast-iron box closed on all sides and having two openings, one above and one below, into which the pipes J and H are secured by means of couplings. This water-back is put in the fire-box and takes the place of one or more of the fire-brick. The pipe J is carried up a short distance and enters the boiler,

which is full of water. The pipe J connects the bottom of the boiler through the pipe H to the water-back. When the fire is lighted the circulation and keeps it up is due to the difference in the weight of hot and cold columns of water having a hight between H made the greater will be the difference in weight and, consequently, the greater the power obtained for forcing the circulation.



Novelties.—Fig. 5.—Hidden Adjustable Door Knob, Manufactured by the Union Door Knob Co., Detroit, Mich.

the water-back becomes heated, and thus heats the water within. The cold water of course passes down through the pipe J into the boiler, where it is forced at once to the top. This circulation will be kept up so long as fire is applied at K, and the water in the upper part of the boiler will be gradually heated. There are some drawbacks connected with this method of circulation, owing to the fact that when the water is forced out of the pipe J into the boiler it encounters cold water, and loses much of its heat before it reaches the highest point. A better plan has been recently patented by Messrs. Creque, Ronalds & Co., corner Beekman and Cliff streets, New York City. This is shown in

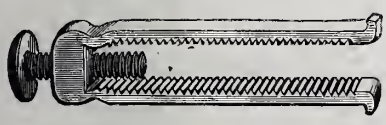


Fig. 6.—Steel Yoke Employed in the Door Knob Furniture Shown above.

Fig. 9. Here the water-pipe is carried to the very top of the boiler, and of course has no opportunity to mix with the cold water. Being lighter than the cold water when it enters the boiler it spreads out in a layer on the top. It mixes so little that it is easy to feel with the fingers where the hot and cold water meet, the line between them being not

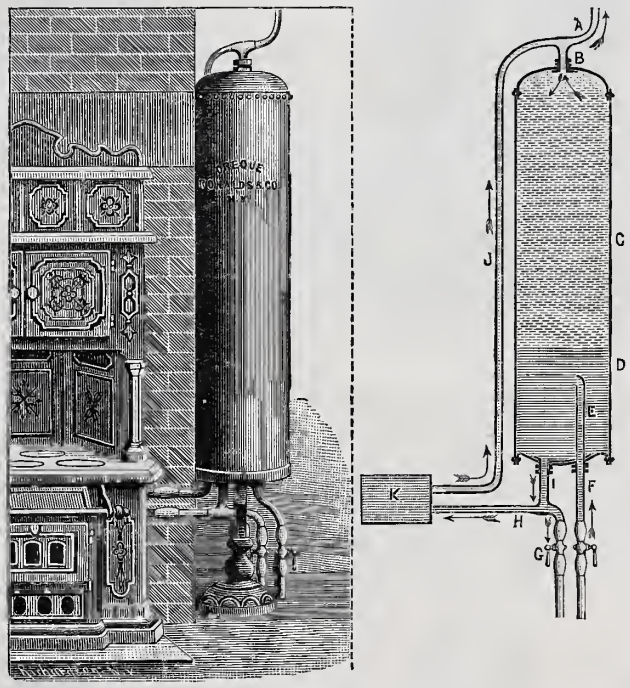
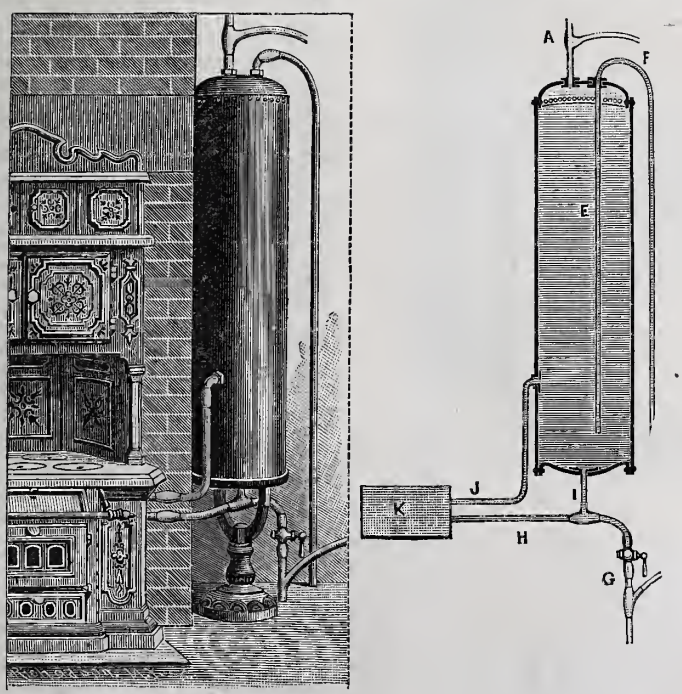


Fig. 9.—Elevation and Section of Creque's New Circulation Boiler.



Figs. 7 and 8.—Boiler Circulation.—Elevation and Section of Common Range Boiler and Water Back.

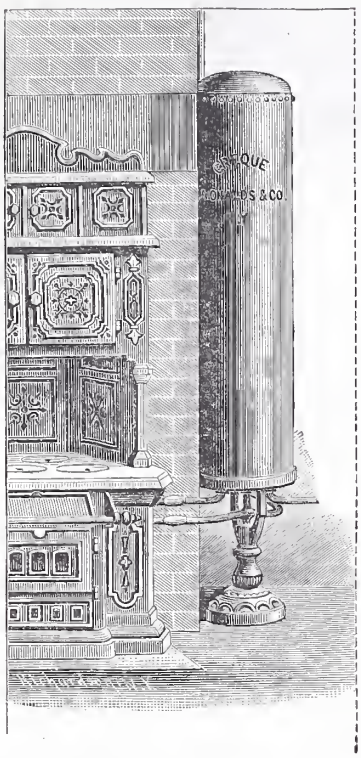
more than an inch or an inch and a half in breadth. In Fig. 8 the power which starts and the point where the pipe J enters the boiler. The longer these columns can be

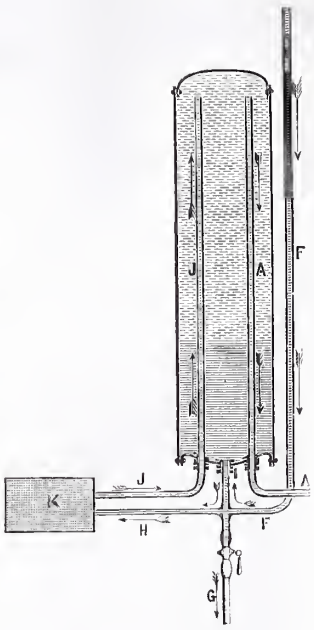
In Fig. 9 the hot and cold columns of water have a hight equal to the distance between the points H and A, or nearly 7 feet, while in Fig. 8 this distance is rarely more than 3 feet, and often less. In other words, the improved form of circulation gives a power of more than three times as much as that ordinarily employed. This is of great advantage, as it enables us to overcome resistances due to bends, running traps and long connections, which the ordinary form does not give.

So far we have considered only the circulation of the water. The operation of the boiler needs a certain amount of explanation. From the pipe I a branch extends downward through the floor. In this branch the cock G is placed. Its use is to empty the boiler when cleaning becomes necessary, the pipe G being in all cases connected with the sewer or with the sink. The pipe F brings cold water from the street main into the boiler. This water is delivered through the pipe E to a point near the bottom. Just inside of the boiler the pipe has a small hole in it, the purpose of which is to prevent the water being syphoned out of the boiler in case of water supply being cut off from the main, &c. At first it is a little puzzling to understand how, when cold water from the street main is passing into the boiler, hot water may be drawn from it at the same time. A glance at the diagrams, however, makes this clear. The hot water is forced out of the pipe A whenever the faucets are opened by the pressure of the cold water in the pipe F and E. This cold water, however, is delivered at the bottom of the boiler and, being heavier than the hot water, of course forces that out of the opening. The same

action takes place in Fig. 9, where the cold water enters by the pipe E and F in the direction of the arrows, and rising under the hot water, which is represented by the lighter shading, forces it out whenever the hot-water faucets are opened.

It is exceedingly important in considering the working of a circulating system, and in order to have no confusion of ideas when handling a water circulation, to remember that hot water does not rise of itself. It always falls unless it is prevented from doing so by some obstacle. When hot water and cold water come together in the same vessel, the obstacle which prevents the hot water from falling is the greater weight of the cold water. The circumstances are always similar to that of a scale beam. The heavy end pulls the lighter one up, and it is the heavier cold water that pushes the lighter warm water upward.





Norelties.—Fig. 10.—Creque's New Circulation Boiler for Use with Cistern.

The advantages of Fig. 9 are found in the fact that the hot and cold water cocks are opened, or when the water is withdrawn from the street main, the short pipe E is inserted in the improved boilers, and, in order to prevent it acting the part of a jet and throwing its water upward into the hot water, the end is turned over so that it delivers its stream in a horizontal direction. In Fig. 10 we have the same principles applied, but in a much more elegant form, especially for flats or houses in the country, where it is an object to have as little outside plumbing work upon the boiler as possible. In this case the fire-box is arranged as usual. The cold-water pipe comes down, from a cistern, in the pipe F F, and passes directly into the water-back with a short connection to the bottom of the boiler. The hot-water pipe, J J, in this case is carried up inside of the boiler to a point within a few inches of the top, where it delivers its water. Instead of taking the hot water from the top of the boiler by an external pipe, the pipe A A is carried up from the bottom.

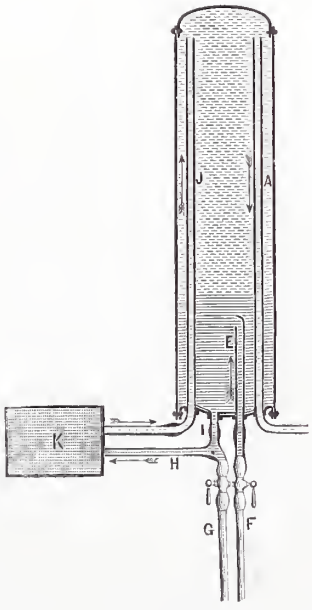


Fig. 11.—New Circulation Boiler Adapted for Use in Flats.

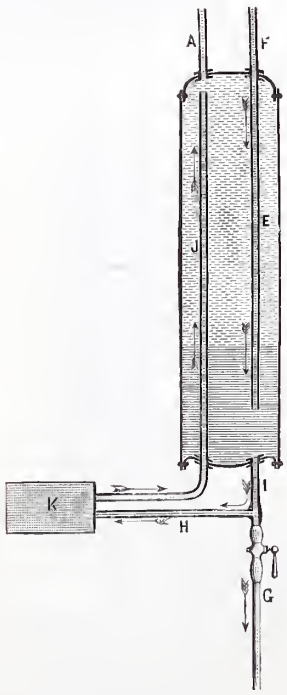


Fig. 12.—New Circulation Boiler as Placed Below Hot Water Fixtures.

Of course there are some advantages sacrificed by this arrangement, as the hot water has to rise through the cold water and is slightly cooled in consequence. This cooling, however, amounts to only a few degrees, and the advantages of dispensing with the plumbing work usually more than counterbalances it. In some experiments which we made a few weeks ago, with three boilers of different forms, which we have shown, we found that a boiler similar to Fig. 10, brought the water up to a temperature of 90°, while that shown in Fig. 9 had reached 142°. Number 1 had in the same time heated its water only about 10°, or 85° in all. In both of the styles shown in Figs. 9 and 10, the hot and the cold water were not mixed, and the dividing line is plainly perceptible on the boiler. The old style, or that shown in Fig. 7, was uniformly warmed all through, and although the quantity of heat imparted to the water in each one was about the same, yet in the old there was a large mass of warm water, while in the new or improved circulation the warm and cold water were kept entirely separate, and it was possible within five minutes of the time the fire was started, to get some water that was hot.

Messrs. Creque, Ronalds & Co., have patented a great variety of combinations by which saving in plumbing work can be obtained, boilers made cheaper and in a more simple manner, and the advantages of a perfect circulation secured even in the hands of those who are comparatively inexperienced in setting up plumbing work. Fig. 11 shows an arrangement of boilers which is very convenient in French flats and other situations where it is not desired to have the hot water delivered above the level of the boiler. When the pipe that conveys the hot water downward is inside of the boiler, the plumber has nothing to do but make his connection at the bottom. In fact all the connections are made in the bottom of the boiler, the pipe F E being the inlet and G the waste. In Fig. 12, the hot water is taken from the top of the boiler and the supply which comes from the tank enters at the same place. This form of boiler has two connections at the top and two at the bottom, and is easily adapted to country uses where a tank is used, and where it is desired to carry the hot water to upper floors, as well as to use it in the kitchen. Fig. 13 shows the boiler fed from below, but with no side pipes whatever. The hot-water pipe J J is carried inside of the boiler to the top, from which the pipe A takes the water to the upper floors or delivers it where it may be needed, while the bottom connections are reduced to three. In these diagrams only a few of the numerous arrangements possible are made, but they are sufficient to give the builder an idea of the possibilities of the new system, and the very considerable saving in piping which may be effected by it.

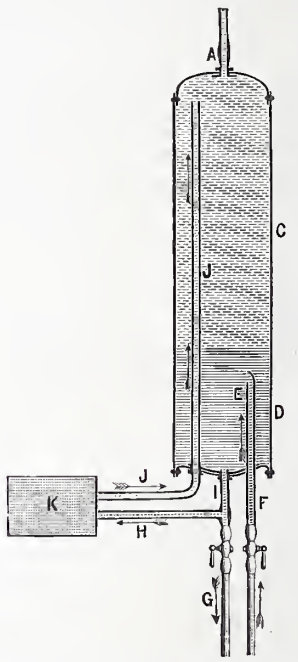


Fig. 13.—Boiler Placed Below Hot Water Fixtures, Supplied from Street Main.

CORRESPONDENCE.

We present this month an issue of *Carpentry and Building* of unusual dimensions, made necessary by the large amount of space occupied by the specifications which we publish in another part. While we have added as many extra pages as a preliminary estimate of the space that would be thus occupied showed to be necessary, we find ourselves at the last crowded for room and forced to reduce our correspondence department to the smallest possible space, and to omit entirely some attractive features we had specially prepared for this issue. This much explanation is due to those subscribers whose communications are waiting an opportunity for publication, and to all who may receive a copy of this issue as a specimen. The great interest that centers in our specification contest justifies the space we have devoted to it. It has, however, in connection with other matters, as, for example, the very full set of details presented with our house plans this month, forced us to give very small space to matters in which we know a large number of our readers are specially interested. We hope by next month to get back to regular work, and to have space for a number of interesting letters which we are as anxious to print as their writers are anxious to have published.

Drafting Table.

From E. C. B., *Winsted, Conn.*—I have presumed that the readers of *Carpentry and Building* would be interested in a description of my drafting table. Accordingly, I inclose drawings of the same, which are to a scale of ¾ inch to the foot. Fig. 1 represents a front elevation, Fig. 2 a side elevation and Figs. 3 and 4 are vertical and horizontal sections, while Fig. 5 shows the table ready for use. The original frame was a cheap pine wash-stand. By putting in sides, back and a new top I made about as convenient a table for my purpose as I have ever seen. It takes up very little room when not in use, and when spread out it gives all the room necessary for the work. The top can be inclined at any angle, being hinged in front. For detail work, the extension E can be spread out and held by the cleats B at each end. The leaves L are to hold tools, books or drawings for reference. I have a small hook at A to prevent the brace that holds the leaf from being pushed up.

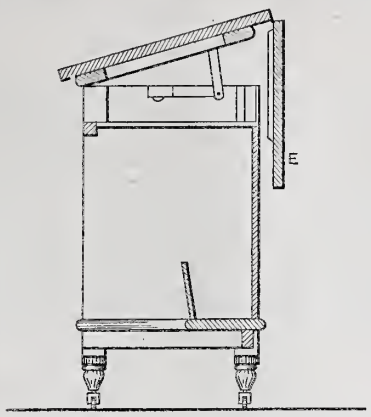
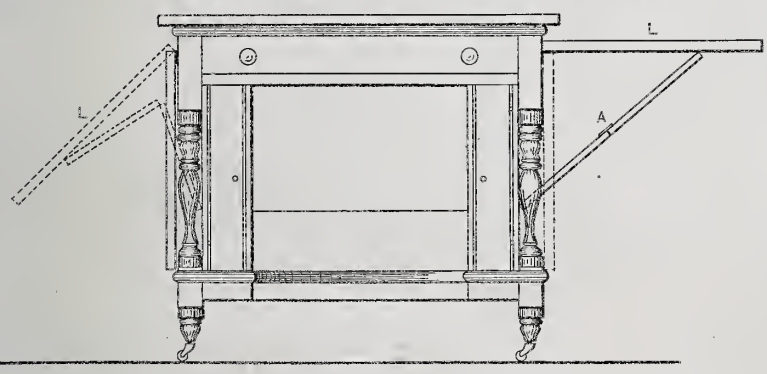


Fig. 3.—Vertical Cross Section.

The cupboards are very convenient for holding books, and serve also as catch-alls for holding old drawings. One of the sketches shows the drawer as I have it partitioned off. This, however, should be fitted up to suit each individual who makes use of a table of this kind. The way I have it might not necessarily be the best for some one else. If any one likes the idea here explained, it is not necessary to confine them to an old wash-stand for a foundation. The same results may be accomplished by originating the framework as well as the attachments.



Drafting Table.—Fig. 1.—Front Elevation of Table as Built by E. C. B.

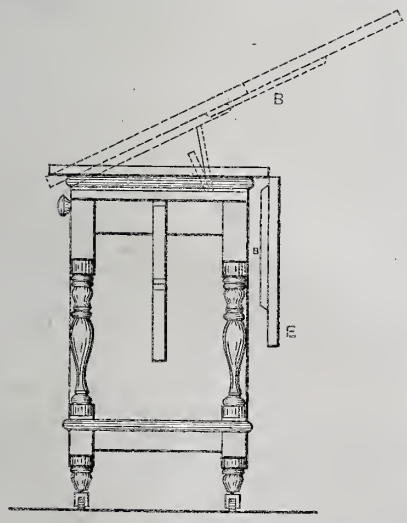


Fig. 2.—Side Elevation, showing Position of Top when Elevated.

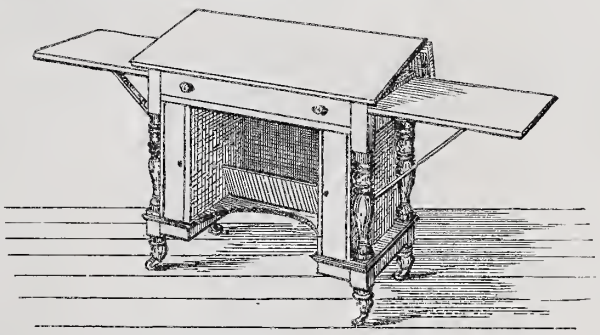


Fig. 5.—Perspective View, showing Side Leaves Extended.

Pitch of Roofs.

From C. S., *East Thetford, Vt.*—If a building is 21 feet wide, what will be the length of rafters if the roof is built two-thirds pitch? Some carpenters say 14 feet, making the length of the rafter two-thirds the width of the building. Others say square up from the center one-third of the width of the building, then the hypothenuse of the triangle thus formed will be the rafter required for a two-thirds pitch. We desire to leave it to *Carpentry and Building* for settlement.

Answer.—There seems to be a difference in opinion on this matter of pitch as between mechanics. Customs in various sections of the country we find differ, or, in other words, the same terms mean different things in different places. As laid down in the books, and correctly, too, we believe, pitches expressed in fractions mean the hight of the ridge above the plate in parts of the span. If we say a roof is one-half pitch, and the span is 30 feet by this definition, it would mean that a vertical hight of 15 feet is measured above the plate, and that the hypothenuse of the triangle thus formed will be the length of the rafter. This plan, we believe, is in most general use throughout the country. The other method to which our correspondent refers is in limited use, but not by the most experienced builders. We gave this subject attention in our January issue for 1879. Those of our readers who have a copy of that number will find in the "Familiar Talk About Roofs" that the subject of pitch received careful attention.

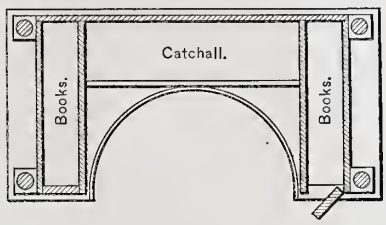


Fig. 4.—Horizontal Section.

Characteristics of the Figure 9.

From BOOKKEEPER.—My attention has been called to an article bearing this title in the issue for September. The author of the article omitted to mention one of the peculiarities sometimes very useful to bookkeepers. If in posting into the ledger the figures of an entry have been transposed, the error, as shown in the trial balance, will be a multiple of 9. For example, take the amount 287.50. Transpose the figures, making any combination possible. The difference between the sum so transposed and the original sum will be a multiple of 9. A knowledge of this fact will often determine the nature of an error in a trial balance, and will make it possible to discover it without checking over the month's work.

From C. R. H., *New York City.*—I have read with interest the communication from D. F. H., Topeka, Kan., on "The Characteristics of the Figure 9." and I will give some of my own experience in response to the invitation embraced in the concluding remarks in that letter. What in 1835 came to the notice of your correspondent, and other matters which he puts forward in his communication, are said to have been discovered

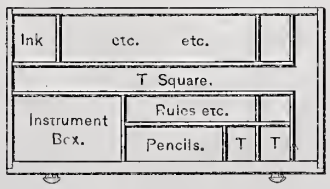


Fig. 6.—Plan of Drawer, showing Compartments.

by W. Green, Esq., who died in the year 1794. Consequently, this subject has for many years received considerable attention. Regarding still other characteristics of the figure 9, I would call attention to the following, which was discovered by M. de Mavin. If any row of figures be taken, and their order be reversed, and one sum thus constituted be subtracted from the other, the sum of the figures representing the answer will be some multiple of 9, and the sum of the figures representing this multiple will also be 9. For example:

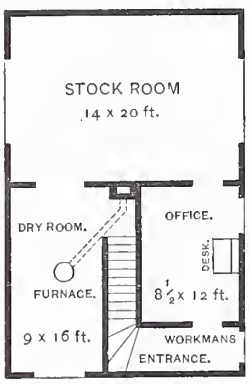
Take the sum	59,871
Reversing the order, we have	17,895
By subtracting, we obtain	41,976

The sum of these figures is 27, and 2 + 7 = 9.

If the numbers are raised to their squares or cubes, the same results will be obtained. Thus, to begin the example over again, we will start with 62, which reversed is 26. Subtracting 26 from 62 leaves 36; and 3 + 6 = 9. The square of 62 is 3844, and the square of 26 is 676. Subtracting the smaller from the greater we have 3168, the sum of the figures composing which equals 18; and 1 + 8 = 9. Again, the cubes of 62 and 26 are 238,328 and 17,576 respectively. By subtracting we have 220,752, the sum of the figures composing which gives 18; and 1 + 8 = 9. I hope these facts will be of interest to the readers of *Carpentry and Building*, and that they will call forth still further communications upon this subject.

Plan of a Carpenter's Shop.

From L. H. H., *Summitville, Ind.*—I inclose the first and second floor plans of a building adapted for use as a carpenter shop.



Plan of a Carpenter's Shop.—Fig. 1.—First Floor.

The first story should be 9 feet high and the second one 12 feet high. A damper should be put in the flue, so that in winter the heat from the furnace can be turned out into a drum as indicated. The building, if made of

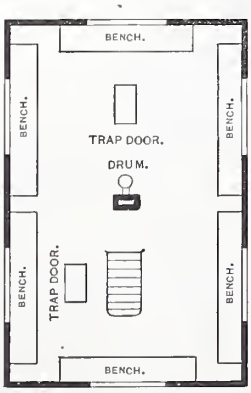


Fig. 2.—Second Floor.

frame, should be sided double. There should be removable trussels made for storing lumber on in the dry-room. They should be high enough so as to admit a man gettiug underneath to attend to the fire, and they should be strong enough to support all the weight of lumber that would ever be necessary to put on them. Any breakage in them from fire might cause serious loss; hence the necessity of careful attention to matters of this kind. Trap doors are provided, to make it convenient for taking materials from the dry-room to the shop, and for the transfer of finished work to the stock-room. A good long window should run horizontally along each bench, about 12 to 14 inches above the top of the bench. The size of the building is 20 by 30 feet.

List for Estimating.

From C. S. W., *Bismarck, Dakota Territory.*—In the September number of *Carpentry and Building* I notice a communication from J. I. M., of Westerly, R. I., with regard to a list by which to figure buildings. I inclose a list that I have printed for my own use. It is imperfect as yet. I had these lists cheaply bound 100 in a book. The leaves on one side are blank on which to make figures. I figure an average of three buildings a day during the building season. When a book is filled I number it and put it away for future reference.

Items.	Style of Material.	Price.	Specifications.
Foundation			
Sills			
Sills			
Sills			
Sills			
Sills			
Joists			
Joists			
Joists			
Joists			
Joists			
Ceiling Joists			
Side Studding			
End Studding			
Partition "			
Partition "			
Partition "			
Partition "			
Plates			
Purlines			
Struts			
Ties			
Braces			
Braces			
Rafters			
Rafters			
Rafters			
Hip Rafters			
H. F. R.			
Roof Boards			
Sheathing			
Labor			
Ship Lap			
Labor			
Drop Siding			
Lap Siding			
Labor			
Paper			
Shingles			
Labor			
Cornice			
Corner Boards			
Outside Base			
Flooring			
Floor Lining			
Labor			
Doors			
Windows			
Stairs			
Base			
Pantry Shelves			
Plaster			
Paint			
Chimney			
Dorm r			
Bay Windows			
Gutters			
Outside Blinds			
Inside Blinds			
Cupboards			
Clothes Hooks			
Covering Plank			
Trap Doors			
Cellar Doors			

Method of Obtaining the Camber in a Howe Truss.

From W. D. H., *Sand Hill, Missouri.*—A number of communications have been printed in *Carpentry and Building* during the past few months with reference to this question. In the January number, on page 20, Waltham asked, What gives the camber to a Howe truss? Although a number of answers have been submitted, careful examination of the articles reveals that nothing yet has been offered by which Waltham or any other inquiring mechanic would be able to lay out the work in a practical manner. If anything of this kind has been published I have entirely overlooked it. Accordingly, at this time I propose to attempt to tell your correspondent how to lay out the chords of a Howe bridge so that it will have a camber when in position. I will presuppose that the chords are properly packed and are ready for spacing. I would commence with the lower chord. First make a spacing pole. We will say that the spans are designed to be 9 feet long; therefore, use a pole sufficiently long to contain a space of 9 feet, and at these points make a cut with a sharp-edged knife. I am in the habit of using a common shoe knife, finding it a very convenient article. At the extremes of the 9-foot space on the pole make cuts to indicate points. I employ a pole longer than the space, so as to set the end of the spacing knife into the cut, thereby obtaining great exactness of measurement. The same accuracy is not likely to be obtained if the knife is placed at the end of a measuring pole, because the workman is very apt to get the thickness of the knife blade too much every time. Such errors as this will not do in a Howe bridge. First, lay off the abutment or pier panel, as the case may be, and then all the spaces in the lower chord, beginning at one end, it does not matter which end, and all of the panels are to be exactly 9 feet, as above mentioned, except the pier panels, which are short, depending upon the width of abutment.

Having laid off the bottom chord, next proceed with the top chord. It is the difference between the top and bottom chords that gives the camber. This the correspondent who originally proposed the question is undoubtedly aware of by this time, for others have told him so If now I can tell him so that he can do it as well as know it, I will have obtained my object. The first step is to make a pole as before, except that it is to be longer. If the bridge has ten 9-foot panels on a side in the lower chord, and it is desired to camber it 5 inches, then the new pole for spacing the upper chord should be made 9 feet ¼ inch in length. In an 80, 100, 120, 140 and 160 foot bridge it is common to use 3-16ths of an inch in the upper panel. From this the reader will see that the spacing pole is made from 4-16ths to 3-16ths of an inch longer for spacing the upper chord than for spacing the bottom chord, as the case may be. Instead of beginning at the end, as in the lower chord, we will find the exact middle of the length of the upper chord, and use that as a starting point. Take the new pole, which is ¼ of an inch longer than the spacing pole used for the bottom chord, and beginning at the middle point, space toward one end until that half is done, making five spaces, each 9 feet ¼ of an inch in length, following which will be the short pier space. After finishing this first end, or half of the upper chord, go back to the middle of the same chord, and starting at the same point in the same way, lay off the opposite side. If the work is done carefully and accurately, it will be all right. Cut all the braces of one length, and commence screwing the truss at the center running toward the ends.

Some bridges have braces of different lengths. For instance, the Burr bridge has but four braces alike on the whole bridge. The gist of all I have said here may be summed up, as the saying is, in a moral. It makes no difference where you begin to space in the lower chord, but in the upper chord it is always necessary to begin at the center and work toward the ends.

Strength of Joists.

From R. O. B., *Lewisburgh, Pa.*—In answer to the question proposed by C. R. S., in the October number of *Carpentry and Building*, I would say that the joist is reduced in strength nearly 45 per cent. by relishing it as indicated in the sketch. If the joist has a width of 2 inches and a depth of 12 inches, and is uniformly loaded, its actual breaking load is 16,150 pounds. On the other hand, if the joist is relished 3 inches, as indicated in the corresponding sketch, its net breaking load, uniformly distributed, is reduced to 9000 pounds. In practice, about 1-6th of these amounts are taken as safe loads for such frames.

Figures on the Steel Square.

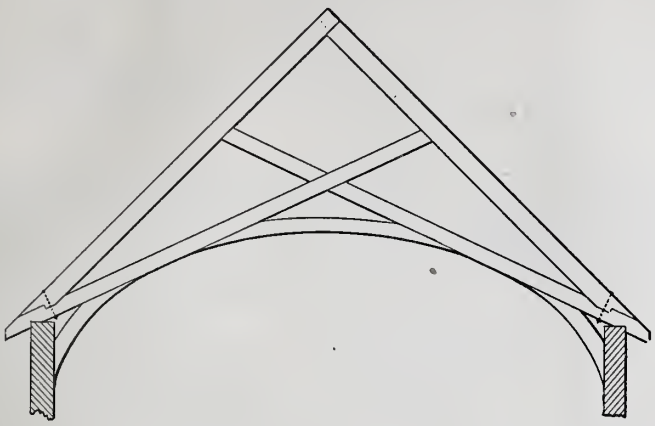
From E. W. K., *Cootes Store, Va.*—Will you please explain the use of all the small figures on the steel square?

Answer.—This question was thoroughly discussed in the January number of *Carpentry and Building* for 1880. We think that if this correspondent and others who are investigating the subject of the steel square will refer to this article, and also others scattered at irregular intervals through the columns of this journal in the four years that it has been published, they will find all that they require.

REFERRED TO OUR READERS.

Rod for a Double Door.

From G. H. V., *Perry, Iowa.*—Does any reader of *Carpentry and Building* know of a rod for putting in the stile of a double door made double the thickness, and intended to work by itself, not being in any way connected with the door-lock? I am in want of two articles of this kind, and would be grateful for the information where they can be obtained. Some 10 years ago I made a double door and put in a rod of this character. It gave satisfaction, but I cannot now find where the article is made.



Church Roof.—Fig. 1.—Sketch of Roof Built by W. H. F. at Carmi, Ills.

Church Roof.

From W. H. F., *Terre Haute, Ind.*—I desire to say to T. P., who inquires about the framing of a church roof in a recent number of *Carpentry and Building*, that he cannot put on a roof satisfactorily as he proposes. The spring in the rafter will allow the building to spread. I built a church at Carmi, Ill., and employed a roof of the kind specified. The result was that it spread about 3 inches. I used 2 x 8 joists and bolted them all at the top, and yet found that I could not overcome the spring that will take place in the timber. My rafters were both fastened at the plate. The lower rafter pulled the other one down. The inclosed sketch shows the construction, the dotted lines being the spring. The way for your correspondent to frame his roof is to employ a Howe truss lengthwise with his building and frame his rafters to, it as indicated in Figs. 2 and 3 inclosed. By this means the weight will be distributed. I would suggest making the cords of 2 x 10 pieces, spiked and bolted top and bottom. The braces should be 4 x 6. The truss rods should be 1 inch in diameter. I would suggest building the walls of gables as much higher than the side walls as it is desired to have the arch in the ceiling. Then put the truss in position, and after this is done place the rafters as indicated in my drawing.

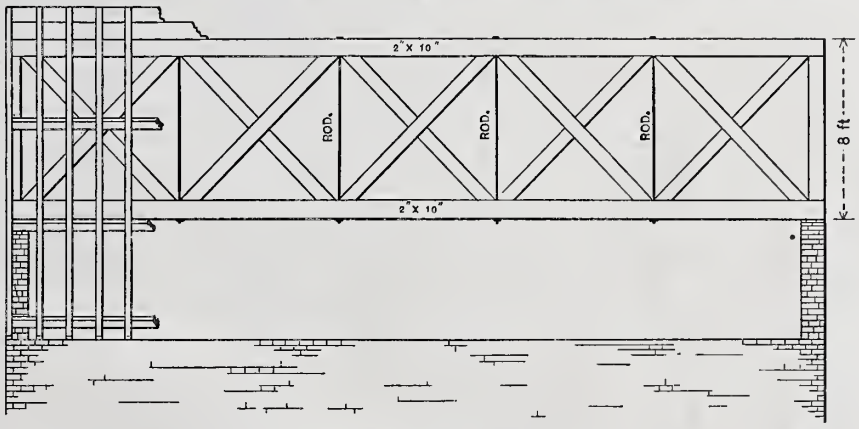


Fig. 3.—Side Elevation of Howe Truss recommended by W. H. F., in Connection with Rafters Arranged as shown in the Preceding Cut.

Tools for Stairbuilders.

From E. A. C., *Mitchell, Ont.*—I am a young mechanic and desire to learn stairbuilding, but do not know what tools are necessary for working at circular pieces of hand-rail. Will some of the practical readers of *Carpentry and Building* supplement the instruction which has been given in its columns by some account of the tools used by stairbuilders?

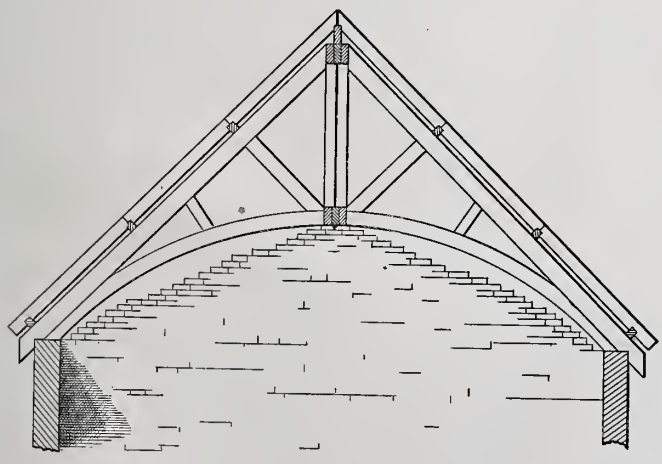


Fig. 2.—Sketch of Rafters Forming Church Roof, in Connection with a Howe Truss.

Ice House and Milk House.

From C. H. M., *Waukesha, Wis.*—Will some practical readers of *Carpentry and Building* furnish plan and specifications for the construction of an icehouse and milk-house combined, the capacity of which will be sufficient for containing the milk of six or eight cows? Information on the above subject will be of great value.

Finishing Curled Maple.

From J. C. B., *Aledo, Ill.*—Will some reader of *Carpentry and Building* give me through its columns a receipt for finishing curled maple so as to produce the best effects?

Polish for Wood.

From E. T., *Philadelphia, Pa.*—I desire information with regard to a polish that will give a good gloss to woodwork. I want something to use after the wood has had three coats of shellac and has been well rubbed down with pumice-stone and oil. If some reader of *Carpentry and Building* will give me practical information upon this point, he will confer a favor.

Cheap House Plans.

From A. B. W., *Shelbyville, Ill.*—I have taken *Carpentry and Building* ever since it was started. I must say it gets better every month. I am well pleased with the start it has taken this year in presenting house plans to its readers. Now, as a ground plan does not take up much room, I think a few plans for cheap houses would be of interest. I am sure the Editor would give them space in his columns. Will not some of the practical readers of the paper please present some plans for publication?

Store Fronts.

From F. D. G., *Fort Worth, Texas.*—I shall be glad to see in *Carpentry and Building* elevations and details of store fronts, together with styles of shelving, designs of counters, &c., adapted for use in hardware stores, groceries and the like. Practical readers of the paper who can contribute in this direction will be conferring a favor on those of us situated in this part of the country.

Constructive Brickwork.

From G. F. L., *Boston.*—I have noticed with interest the suggestions in several issues of *Carpentry and Building* as to articles on bricks and brickwork. Such subjects discussed in its columns would be of value to the readers, since the paper has been generally devoted in the past to the art of carpentry. In addition to the questions already proposed, I would suggest that the modes of construction of arches, flat, straight and circular, for windows and doors, with details of actual construction, be considered. Some communications from practical men on topics of this kind will be a change in the right direction.

Spindles of Carriage Axles.

From W. F. B., *Chicago.*—I desire to learn what rule carriage makers use in proportioning the spindles of carriage axles to different sized wheels? I would like to know if a spindle 1 inch in diameter for a given size of wheel is better than a spindle ½ inch in diameter? It seems to me that the larger spindle is to be preferred, because it does not take as many revolutions to run a certain space. On the other hand, the larger the spindle the more friction there is. If some of the practical readers of the paper will enlighten me upon this point they will confer a favor.

Corner Sideboards and Bookcases.

From A. W. R., *Eagle Mills, Mich.*—Will not some practical reader of the paper in some future number of *Carpentry and Building* furnish designs for corner sideboards and bookcases. There are many admirable places for such articles in the new house plans lately given in the paper, and I think designs accordingly would be greatly appreciated by the readers.

Calculation of Masonry.

From T. N. F., *Philadelphia, Pa.*—Will some practical reader of *Carpentry and Building* tell how many perch of stonework is contained in the walls of the building represented by the inclosed sketch, quarry measure, and also how many perch of stone-

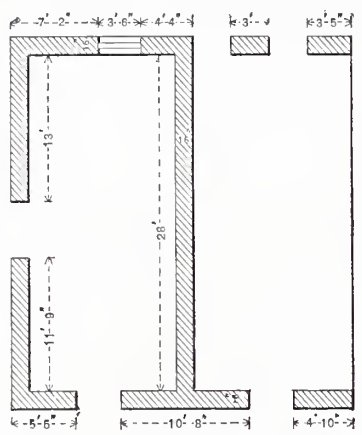


Diagram Accompanying Question Proposed by T. N. F.

work there is in the same, masons' measure? The work is rough stonework, the walls dashed inside for two cellars. The hight is 5 feet 6 inches from the bottom of trench. The walls are 16 inches thick. The wall under the window, shown at the top of the sketch, is 4 feet high. The scale of the sketch is 1-16th inch to the foot. I desire to learn how to calculate for quarry measure and also by masons' measure. What allowances are necessary to make for jambs and projections? What is the difference between the two measures?

Removing Oil and Varnish.

From J. H., *Cold Water, Mich.*—I desire to inquire if there is any method by which oil and varnish can be removed from wood. I have in my house two rooms finished in ash, oiled. An inferior quality of boiled oil was used for the purpose and it does not get hard. It is sticky, and what I would like to do is to get it off without staining the wood. If some one will tell me how this can be accomplished he will greatly oblige.

Exhaust Blower.

From H. C. K., *North Greece, N. Y.*—I desire to ask of the practical readers how I can construct a cheap exhaust fan for a barrel-heading machine? The machine makes about three bushels of sawdust per hour, which I desire to use for fuel. The engine is located 20 feet from the machine. I desire to have the fan as small as possible. The machine is in a direct line with the furnace, so that a straight spout is all that is necessary. I would like to have the apparatus arranged so as to convey shavings, as well as sawdust, if practicable.

STRAY CHIPS.

S. W. Foulk, of Greenville, Pa., is engaged upon a large amount of work this fall. Several frame dwellings, two churches and some business blocks are occupying his attention.

The Great St. Louis Fair recently closed the most successful week of its existence, October 2 to October 7 inclusive. It is estimated that the number of visitors exceeded 200,000 in this one week. On one day alone the gate receipts, at 50 cents a head, ran over $30,000, while there was a large attendance of stockholders and their friends, exhibitors, restaurant and booth proprietors with their help, admitted free. The streets of the city were illuminated every night during the week on a scale never before attempted in this country, and the parades of the military and of the Veiled Prophets added to the attractions of the occasion.

The Crystal Plate Glass Company, at Crytal City, Mo., about 30 miles south of St. Louis, are again making extensive additions to their factory buildings, and are building some 40 additional houses for the increase in their force which will find employment when the new works are finished, Mr. E. A. Hitchcock, of St. Louis, president.

J. W. Rich, of Chicago, Ill., is building flats at No. 267 La Salle avenue, three stories and basement in hight, to cost, when completed, $12,000.

The new church of the Evangelical Lutheran Congregation, of which Rev. Mosheim Rhodes is pastor, St. Louis, has just been completed at a cost of nearly $50,000. The material is stone, quarry face in broken ashlar. On the level of the street are the rooms for Sunday-school, with infant and Bible classes, also the parlors, &c. The main audience room is above, reached by broad stairs from a spacious vestibule. The organ and choir gallery are at the side of the pulpit. There is no tower nor spire.

The National Union Vaccine Company, of Chicago, Ill., are putting up buildings in Engelwood to the amount of $35,000.

The main building for the Grand Avenue Presbyterian Church at St. Louis, formerly located at Pine and Eleventh streets, on which work has been suspended for many months, is now progressing with a fair prospect of completion without further interruption. The chapel was furnished nearly two years ago, and has been occupied since that time. The walls will be of stone. The general shape of the main building will be octagonal. The estimated cost of the work now under contract is about $40,000. Mr. Francis D. Lee is the architect.

W. Knecht is building two apartment houses on Lincoln avenue, Chicago, Ill., to cost $15,000.

W. Westlake, New York City, is building residences to cost $25,000, on the corner of Forest avenue and Thirty-fifth street, Chicago, Ill.

The Corwith Building, on Market street, Chicago, Ill., between Madison and Monroe, is to be six stories and basement in hight, 98 x 150 feet, and will cost $125,000. It will be finished by January 1st.

The work upon the extension to the capitol a Madison, Wis., is progressing with considerable rapidity.

Messrs. Bradshaw & Blake are erecting a large sugar and syrup warehouse at 188 to 194 Fourth avenue, Chicago, Ill. The building will be six stories and basement in hight, and will cost $30,000.

The contract for completing the Tippecanoe, Ind., County Court House has been awarded for $241,000.

Sutter Bros., Chicago, Ill., are putting up three residences, three stories and basement, on Lake avenue, near the Thirty-fifth street station. They will cost, completed, $45,000.

A project is on foot at Alton, Ill., to supply that city with a suitable opera-house.

Elgin, Ill., is to have a new high school, to cost between $20,000 and $25,000.

A union depot is to be built at Minneapolis, Minn., to cost about $400,000.

Burlington, Iowa, is to have a new Catholic Church, to cost $40,000.

J. Johnson, Jr., is building a $10,000 residence at Geneva, Wis.

John McNeil is building a $14,000 residence at Elgin, Ill.

Lake City, Minn., has voted $8000 for a new schoolhouse.

Plans have been prepared for a new schoolhouse at Kalamazoo, Mich.

George W. DaCunha, of New York City, has in preparation the plans for a four-story brick and brown-stone flat house for Mr. Charles B. Wood. The edifice is to be 25 x 75 feet, and the estimated cost is $16,000. The first floor will be used as stores, while above these will be two sets of apartments of five rooms each on each floor.

The "Grand Paxton," a new hotel at Omaha, Neb., cost $275,000.

Carrolltown, Ill., is discussing the question of a new court house.

The new University library building at Ann Arbor, Mich., now nearly completed, is 154 x 156 feet in plan.

The Catholic school building on Second avenue, Rock Island, Ill., will cost $10,000 when completed.

The Peninsula Club, at Grand Rapids, Mich., has decided to expend the sum of $13,000 for a lot of land, and upon it to erect a club house to cost $20,000.

On the south side of 125th street, between Fourth and Lexington avenues, New York City, Mr. J. M. Horton is to erect a new theater, the plans for which are being prepared by R. Rosenstock. The structure is to be 50 x 90 feet, four stories high, built of brick and stone. The first floor is intended for stores, while the upper stories will be occupied by the Young Men's Hebrew Association for club-room purposes. The theater will have a stage 20 x 48 feet, the auditorium having a seating capacity of 900. There will also be an extensive gallery and four proscenium boxes, the whole interior being richly decorated. The estimated cost is about $45,000.

At Marinette, Wis., a new schoolhouse is being put up, which, when completed, will cost $21,000.

Holly Springs, Miss., is to have a new jail, estimated to cost $11,975.

A new schoolhouse is to be erected in Minneapolis, Minn., that will cost $20,000.

The new freight depot at Madison, Ind., for the J. M. & I. and Panhandle Railroad, will cost $15,000.

The citizens of Wausau, Wis., have been considering the feasibility of building an opera-house that will cost in the neighborhood of $30,000.

A tower and observatory for Government surveying purposes are being built on Ball Bluff, at Palmyra, Wis., by the United States Surveying Company.

Mr. W. B. Tuthill, of New York City, is preparing plans for two cottages, to be erected at Wilkesbarre, Penn., by Gen. P. A. Oliver, at a cost of $5500, and for a cottage for Mr. J. W. Fry, to be erected at Columbia, S. C., at a cost of $3500.

Plans are being prepared by Mr. Albert Wagner, of New York, for a wall-paper and furniture factory, to be erected on the south side of seventy-first street, about 100 feet east of the Eastern Boulevard. The structure will be 7 stories in hight, built of brick and stone, and will be 50 feet wide by 145 feet deep. The stable of the establishment, together with two large boilers, will be located under the sidewalk. The estimated cost is about $50,000. Mr. Edward Leissner is the owner. Mr. Wagner is also engaged upon plans for a 4-story addition to Messrs. Palmer and Embury's factory, corner Water street and Gouverneur Slip, as well as for 2 stories that are to be added to the main building. The addition will be 30 by 50 feet, and the total cost will be in the neighborhood of $25,000.

It is reported that the new stone church of the Catholic Society of Alpena, Mich., when completed, will be the most expensive building, as well as the most beautiful and substantial in that city. It is estimated to cost $40,000.

Reports from Dawson, Dakota, state that a new hotel, 36 by 70 feet in plan, is being erected, and the putting up of several other buildings is contemplated.

Plans have been filed in the Bureau of Buildings, by John F. Dunbar, for five buildings, to be erected on the corner of Tenth avenue and One Hundred and Twenty-Fifth street, New York, to cost $70,000, and by J. M. Horton & Co., for a hall and lodge room, on One Hundred and Twenty-Fifth street, near Fourth avenue, to cost $45,000.

It is estimated that in Elgin, Ill., 250 buildings have been put up during the year, averaging in cost $1500.

Next Season Ishpeming, Mich., proposes to erect a schoolhouse costing $15,000, a Catholic church parochial school costing $6000, and an opera-house.

Subscriptions to the amount of $250,000 have been received for the purpose of erecting a cotton mill that is contemplated at Knoxville, Tenn.

Pensacola, Fla., is experiencing a veritable building boom. It is estimated that at least $600,000 will have been expended for building purposes during the present year.

Asheville, N. C., contemplates the erection of a large hotel building. It is estimated that the cost will aggregate $30,000.

Trinity Cathedral, now in progress of erection at Omaha, Nebraska, is being built of solid stone, and will have cost, when completed, about $50,000.

At Ottawa, Canada, a wing is to be added to the Parliament House at an estimated cost of $1,000,000.

Maryville, Mo., is building a new court house and jail costing $80,000, also a public school building costing $30,000. The jail is of the description known as the "rotary," and is built by Messrs. Haugh, Ketcham & Co., of Indianapolis. The designs of these buildings were prepared by Messrs. Eckel & Mann, of St. Joseph, Mo. J. M. Gile is the local superintendent in charge.

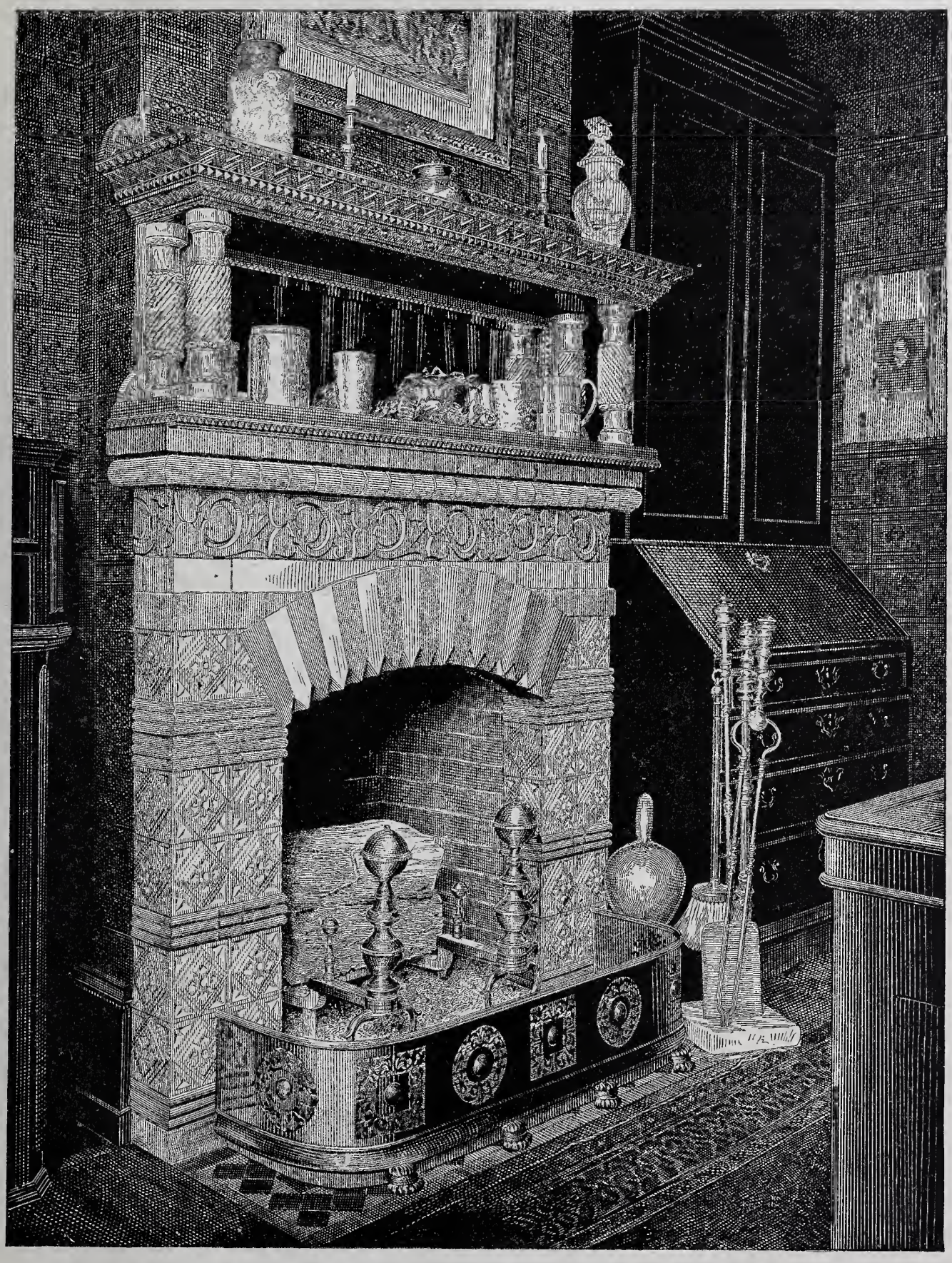
Mr. S. M. Randolph, of Chicago, Ill., has drawn plans for a wholesale building to be erected on the corner of Jackson street and Fifth avenue. The structure is to be 100 x 124 feet, seven stories, with basement. Its cost, when finished, will be about $100,000.

At Milwaukee, Wis., Mr Frank Adams has commenced the erection of a handsome four-story brick block on the east side of West Water street, between Clybourn and Fowler streets. The estimated cost is $25,000

CARPENTRY AND BUILDING

A MONTHLY JOURNAL.

VOLUME IV. NEW YORK—DECEMBER, 1882. NUMBER 12.



Decorative Brickwork.—Fireplace in the Library of Charles Henry Hart, Esq., of Philadelphia.—Engraved from a Photograph by Mr. F. Gutekunst.

Decorative Brickwork.

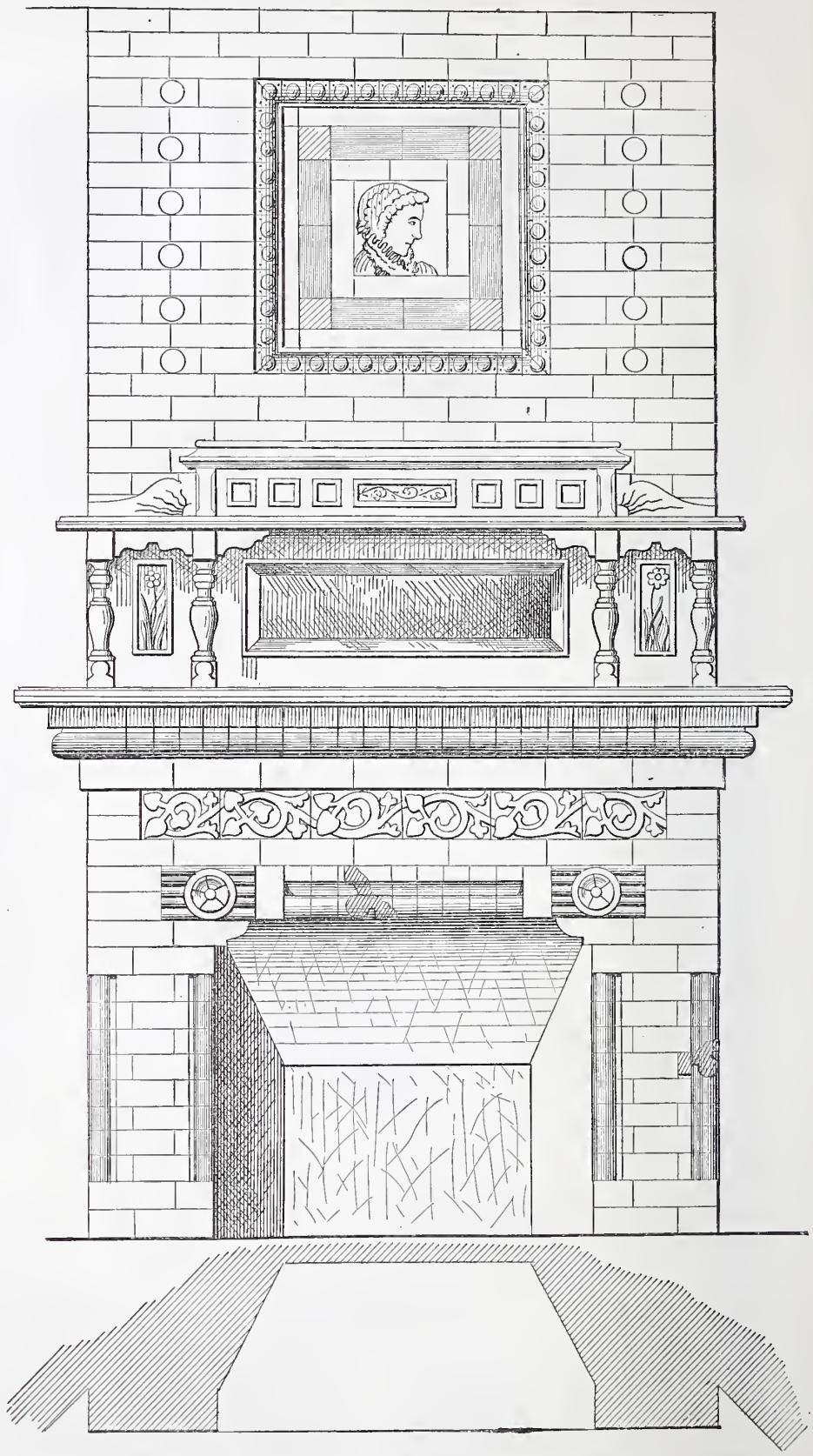
No observer of building matters for the last few years can have failed to notice the free employment of brick in a great many places where this material was not formerly used. Cornices, belt courses, window trimmings and other parts of the exterior walls of buildings are now variously worked in brick of fanciful patterns, forming designs that are at once appropriate and novel. Prominent among those who have brought about the free use of brick, decoratively as well as constructively, may be mentioned the Peerless Brick Co., of Philadelphia, Pa. We have referred to their work heretofore in our columns, notably in the description of the Morse building that we published some two years since. Our attention has recently been called to the use of special patterns of brick in interior decoration. The engraving on the first page represents a mantel-piece in the library of Charles Henry Hart, Esq., of Philadelphia. It is a notable example of the tendency to the still freer use of brick in various directions. The base of the mantel-piece is composed of red and buff brick, while the top is of English oak carved. The engraving so faithfully represents the design and its surroundings that it is needless to enter into further particulars. The engravings upon this and the succeeding page represent two corner fire-places composed of Peerless brick, and designed by Mr. Charles E. Joy, architect, of Dover, N. H., for the counting-room of Sawyers' woolen mills in that city. In both of these cases, as well as in the one already referred to, the upper part of the mantel is of wood, Figs. 2 and 3 being of mahogany. The appropriateness of brick for purposes of this general nature, at least under certain conditions, will be recognized by our readers. While the texture of brick may seem to render it unsuitable for a mantel in a drawing-room or library, no one would doubt its appropriateness for a chimney-piece in an office. By glancing at our first page illustration, however, it will be seen that a happy effect has been produced even in this case.

Brick may be declared to be the coming material. It has proven more durable than granite in the case of conflagrations. It is cheaper than almost any other material with which it can be compared, and with the molded forms that are now produced it can be used decoratively, so as to free it from the charge of being commonplace. It is a notable fact that it forms a conspicuous feature of the new buildings being erected upon city streets in whatever direction we may turn. We think the future will show an increase of this use of brick rather than a decrease. With lumber becoming more and more expensive year by year, there are inducements on account of price for the use of brick, and it does not seem improbable that a moderate-priced house of the future will be a brick structure rather than of wood.

Schoolhouse Competition.

In one of our recent issues we called attention to a competition in schoolhouses, the prizes being offered by Mayor Low, of Brooklyn, N. Y. The competition closed November 20. A prize of $250 was offered for the best plan of a school building to cost not exceeding $15,000; $200 was offered for a building costing not over $20,000, and $150 was offered for a building costing not over $25,000. For some reason so far unexplained the competition was not a success, only a single plan being received. This was for a three-story building to contain two class-rooms on the first floor, two on the second floor and an exhibition hall on the third floor capable of accommodating about 300 people. The estimated cost was $15,000. As Mayor Low's object in conducting this competition was somewhat philanthropic in character, it is to be regretted that greater interest was not taken in it. However, architects in general have learned that it is in many cases a thankless task to compete on public buildings. It seems to be the settled determination of at least a part of the profession to disregard all competitions. A course of this kind has been freely advised by one of the prominent architectural publications of the country, and this may account in some measure for the lack of success in the competition referred to.

Building blocks, plaster of Paris and coal ashes, hollow terra-cotta blocks, terra-cotta lumber and a variety of other similar articles are gradually coming into use to supply the the place of solid or hollow timber construction. In olden times, in England, whole floors were made of grit and plaster of Paris, mixed with various substances. These floors, which had not a few good qualities, although often damp and somewhat porous, have gradually developed into something much better, and now building blocks, holding a minimum of plaster and a maximum of foreign material, are very extensively used on the other side of the water, and are frequently employed here in large buildings. The success of these building blocks has largely been due to the fact that cementing material is now at a minimum, and broken bricks, cinders and other porous material at a maximum. It is generally admitted, however, that these building blocks with a plaster-of-Paris base, cannot be employed for flooring purposes until they are made much harder than is practicable at the present time. For partition walls, however, upon which plaster is to be laid, they can hardly be exceeded, as they effectually deaden the noise and seem to answer every requirement in the best manner.



Decorative Brickwork.—Fig. 2.—Elevation of Corner Fireplace Designed for Counting Room of Sawyers' Woolen Mills, Dover, N. H.—Scale, ¾ Inch to the Foot.

Air Supply for Heating Apparatus.

BY EDWARD S. PHILBRICK.

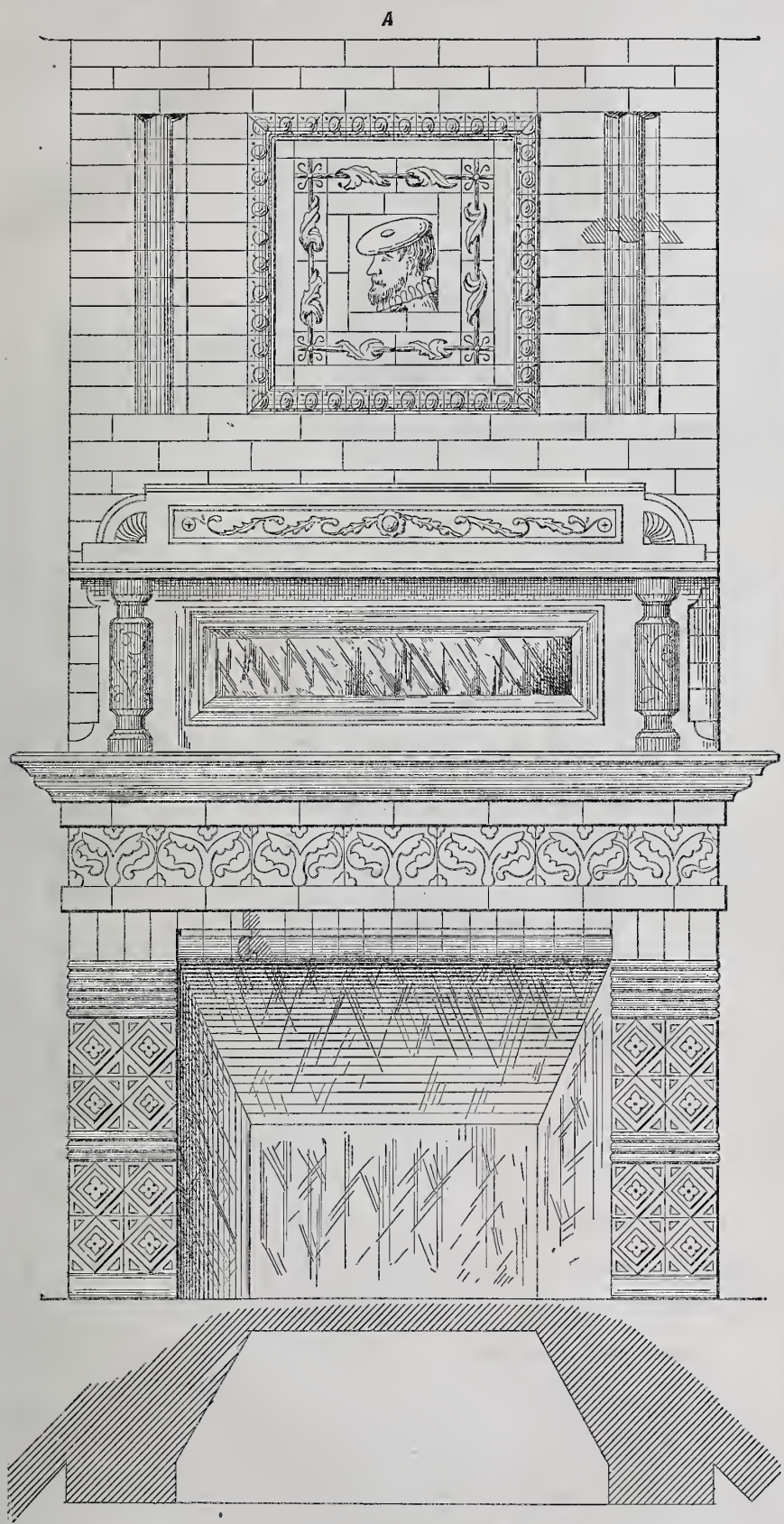
If the air-box of the furnace is not opened after a wind subsides, or if not enough open at any time, the air is often taken by natural laws from one room down to the furnace and up to supply another. The former is then rapidly cooled off, and housekeepers wonder what the matter is.

The same thing often occurs during windy weather if the air-box is not large enough to supply all the demand. In that case, it is always found that the rooms on the windward side of the house cool off, for the air can with difficulty be made to enter such rooms through the hot-air pipes, if the rooms are supplied by leaky windows, unless a small open fire is provided to draw off the surplus pressure resulting from the wind. Such changes of pressure are too slight to be measured by any barometer; but the air moves so easily that its motions are always governed by them. It is quite useless to attempt to heat a room in a wooden house by a furnace on a cold, windy day, on the windward side of a house, without an open chimney flue in the room to relieve the pressure, and this will not always answer the purpose without a small fire in this flue to accelerate the draft.

It is absurd to suppose that air can be continually induced to flow into a tight room, from which no escape is afforded for it. Open fire-places are thus very efficient means of promoting the comfort of a family, even if no fires are lighted in them. The air that enters a room through the heating apparatus always rises at once to the ceiling and spreads out up there. It descends along the windows and walls on that side or sides of the room exposed to the outer air, cooling as it falls, and is withdrawn by the chimney flue. An ordinary fire-place, with its throat within three feet of the floor, is, therefore, a better agent for ventilating a room that is warmed by hot-air pipes than an opening in the same chimney near the ceiling. If the latter alone were provided, the fresh air would escape through it almost as soon as it comes in, without effecting that thorough change of all the air in that apartment which is essential to our comfort and health. Beware, then, of closing the throats of fire-places by sliding valves. It is best to leave them wide open at all times. If they trouble you at times by an inverted draft, pouring cold air into the house on the windward side, start a small fire in them, with closed doors and a crack of a window open; then as soon as the flue is once warmed the draft will continue in the proper direction, and the doors of the room may be reopened, and the window closed.

Houses that have a large number of rooms upon the ground floor, even if more than three when they are good in size, together with one or more stories above to be heated, cannot be made comfortable in our climate by means of one furnace, however large. In such cases it will be found that the rooms on the windy side of the house are the most difficult to warm. In fact, it is not best to try to conduct hot air more than 6 feet horizontally from the furnace. If this limit be exceeded the circulation cannot be relied upon. When necessary to go beyond such limit, it is better to provide two separate furnaces, each having its separate suite of rooms in connection. If a mansion be very large it is better to heat the air by a circulation of hot water or steam in pipes in the basement, with several coils disposed directly under the rooms to be heated. * * * * *

In providing for cold- ir inlets for any kind of heating apparatus, it is important to take the air from a point where it is likely to be pure. It is a common mistake for architects to allow the cold-air box to be constructed under basement floors, where rats make their resort, or where foul water may collect to stagnate from leaky drain or saturated soil. The boxes often terminate at a cellar window in the back yard, alongside of a hen-coop, a dog-kennel or a cesspool, a pile of rubbish or a box of garbage awaiting the daily visit of the collector, and which, whether full or empty, is generally in a very unsavory condition. Few people would think of tolerating such surroundings at their parlor table, yet they forget that the cold-air box takes its supply in such a way as to produce similar results. In crowded streets and in cities generally it is better to terminate the cold-air boxes at least ten feet above the ground. They should also be upon the northerly or northwesterly side of the house, for that is where our coldest winds come from. If on the south side, it is often found that the furnace is supplied with air from the northern rooms, entering the house through window cracks or down a cold chimney, and sending the heated air out through the cold-air box into the back yard. The house is but poorly heated under such circumstances, as might be expected; so the coal is piled on to the fire and the draft stimulated till, in some cases, the wooden cold-air box has been actually set on fire by the overheated air sent out through it. It should be remembered by all architects that it is not an easy matter to induce an air draft to move horizontally in a direction contrary to a prevailing wind, however inviting their conduit may be, and that all our coldest weather is accompanied by northwesterly winds. It is very poor construction to neglect these natural forces and endeavor to work in ignorance of or in antagonism to them. Whoever attempts it will generally find, sooner or later, that Nature's laws never go to sleep and never forget things, and never make exceptions for the sake of



Decorative Brickwork.—Fig. 3.—Elevation of Corner Fireplace Designed for Counting Room of Sawyers' Woolen Mills, Dover, N. H.—Scale, ¾ Inch to the Foot.

good looks or even a liberal expenditure of money, unless it be spent on a plan to conform to their action.

Decision in the Seventh Competition.

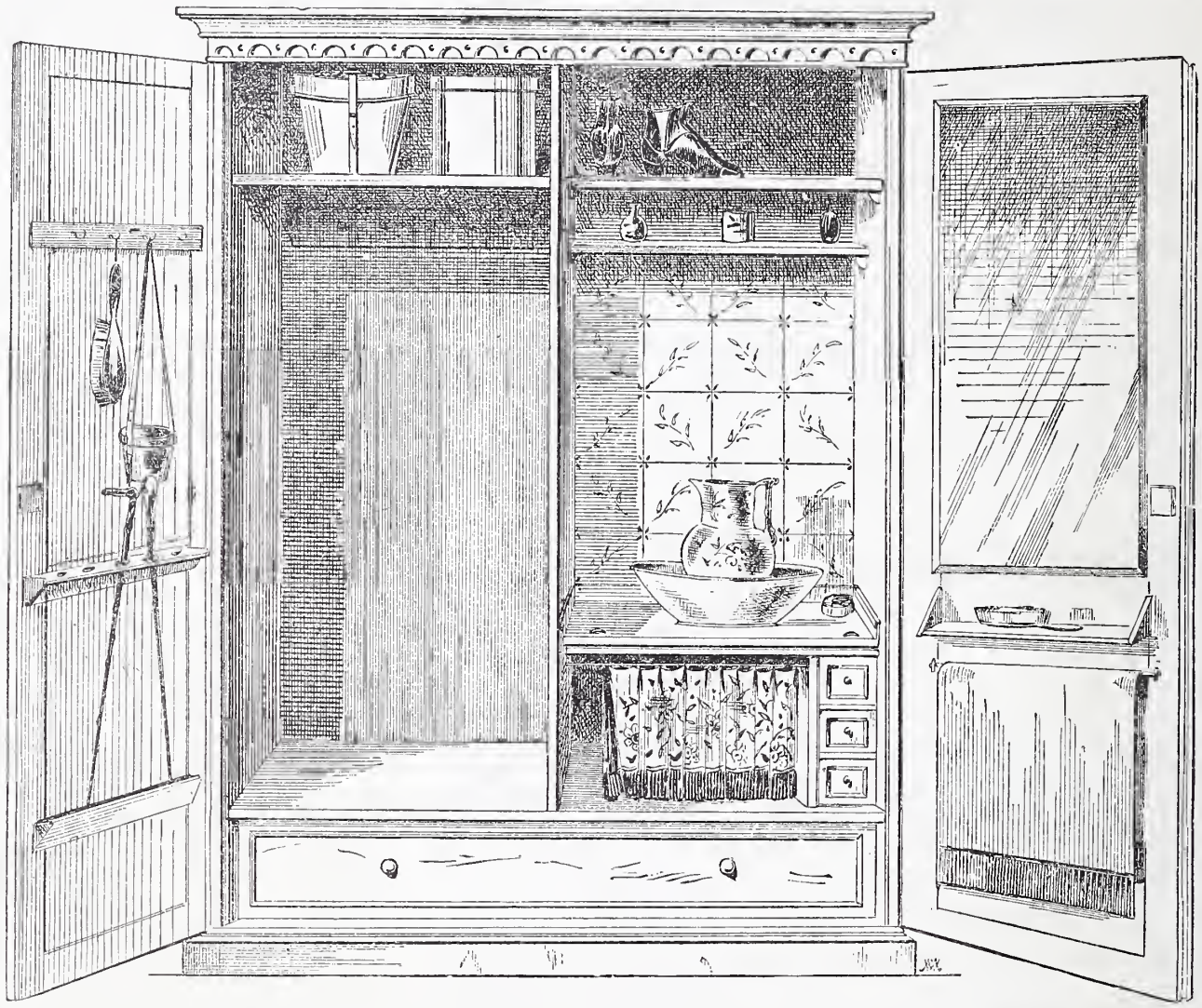
According to the announcement contained in the October and November numbers, the decision in the Seventh Competition conducted by *Carpentry and Building* was referred to the readers of this journal. Ballots were printed among the advertising pages, and the time for voting was restricted to the period between the 7th and 20th of November. In our announcement we stated that the specification receiving the largest number of votes would receive the first prize, while that receiving the second largest number would receive the second prize, and the one receiving the third largest should receive the third prize. According to these conditions, the first prize is awarded to the specification submitted under the *nom de plume* of "Star." The second prize goes to "Midnight Oil," while the third is taken by "Willingly." The names of the successful competitors are as follows: First prize, $50; "Star," B. C. Pond, Room 8, No. 15 Pemberton Square, Boston, Mass. Second prize, $30; "Midnight Oil," Theodore A. Richter, Jr., southeast corner Fifth and Walnut streets, Cincinnati, Ohio. Third prize, $20; "Willingly," Wm. H. Penn, No. 188 London street, Lowell, Mass. Our readers undoubtedly will be interested in knowing the results of the ballot in detail. Of the entire number of votes deposited, "Star" received 49 per cent., "Midnight Oil" 27 per cent., Willingly" 15 per cent., the remaining 9 per cent. being divided between "Jumbo" and "Fides." To satisfy our own curiosity in this matter we canvassed the ballots with reference to their geographical distribution, taking the dividing line between Ohio and Pennsylvania as neutral ground, and calling all east of that line Eastern votes and all west of that line Western votes, and we found that of the ballots deposited in favor of "Star," 49 per cent. were Eastern and 51 Western. Of those deposited for "Midnight Oil," a little over 25 per cent. were Eastern and a trifle less than 75 per cent. were Western. This order was reversed in the ballots for "Willingly," nearly 60 per cent. of the number being Eastern, while about 40 per cent. were Western. Throughout the voting was spirited, and not a few took the trouble to write us letters commending various features of the specifications, signifying their approval of the course of *Carpentry and Building* in conducting the contest, and expressing the opinions of the writers on various incidental points. We think that "Jumbo" would have polled a much larger vote if his specification had been free from the objections to which a correspondent directs attention in this issue. We are warranted in expressing this opinion from the fact that a number have called attention to this circumstance while depositing ballots in favor of one or another of the competitors.

Ornamental Iron Work.

We have received the October number of a catalogue of iron and wire work, roof crestings, wrought-iron fencing, weather vanes, stable fittings, office railing, window guards, &c., issued by Messrs. J. E. Bolles & Co., 82 West Woodbridge street, Detroit, Mich. The pamphlet is neat in its typographical appearance and contains a large number of engravings representing designs of the various goods above mentioned. There is an absence of the well-known stock designs which for a long time have characterized many of the catalogues in this line of business. A number of new designs are presented, and altogether it is a catalogue which it will pay any builder to possess. It is also of interest to all who are fitting up stables or who require ornamental work about the roofs of buildings, on towers, &c.

Combination Wardrobe.

We are indebted to an English exchange, published in the interest of the furniture trade, for the design of the combination wardrobe which we present our readers herewith. The article is unique in many respects, and is made of such parts and of such design that it presents no difficulties of construction from the ordinary carpenter's standpoint, while cabinet-makers will find it well adapted to their needs and likely to fill a want felt in almost every community. By examination of Fig. 1 it will be seen that the wardrobe proper is restricted to the left-hand division. The shelf at the top is a convenient receptacle for hat boxes and the like, while immediately below it is a space for a row of hooks. The door shutting up this portion is utilized by a row of hooks near the top, while a rack suitable for holding umbrellas and canes is placed lower down. A large drawer forms the base of the article. A wash-stand is very happily arranged in the right-hand division. The shelf on which the bowl and pitcher stands draws out when the door is open, thus making the wash-stand more convenient for use. Three small drawers below the shelf add to the convenience, while a screen conceals the slop jar and contributes to the general appearance when open. Above the wash-stand two shelves are provided, some characteristic articles upon which indicate the use to which they may be put. The door closing the right-hand portion is utilized by a mirror at the top, a comb-and-brush shelf near the center and a towel-rack at the bottom. This wardrobe may be declared as one of the *multum in parvo* genus which is rapidly coming into demand on account of the narrow quarters in which many people are compelled to live. It contains almost everything that is required in a bedroom except the bed itself. This article of furniture will in many cases prove useful in bachelors' chambers, and with slight modifications, or possibly with no modifications at



Combination Wardrobe.—Fig. 1.—General View with Doors Open, Showing the Internal Arrangement.

all, it could as readily be used in families. The outward appearance, as shown in Fig. 2, is quite plain and easy of construction. This of course could be modified to suit circumstances. The idea of the design of this combination article is certainly commendable, and we have no doubt that many of our readers will find it useful.

NEW PUBLICATIONS.

BROWN'S BUILDING TABLE AND ESTIMATE BOOK.—By L. E. Brown. 150 pages; size, 6 by 9 inches. Published by William T. Comstock. Price $1.50.

The favorable reception accorded "Brown's Table and Estimate Book" by the trade has justified a new and improved edition. The matter has been reset throughout, some few corrections that were found necessary have been made, and in its improved condition it is again submitted to the building public. The utility of a work of this character—one that reduces to a minimum the calculations necessary to estimates—will be appreciated by every one who examines its pages. The object has not been to supersede judgment in making estimates, or to save the exercise of discretion. It only facilitates figuring in the way of showing how calculations are made, and in many instanees by tabulating results in a way to render them easy of use whenever required.

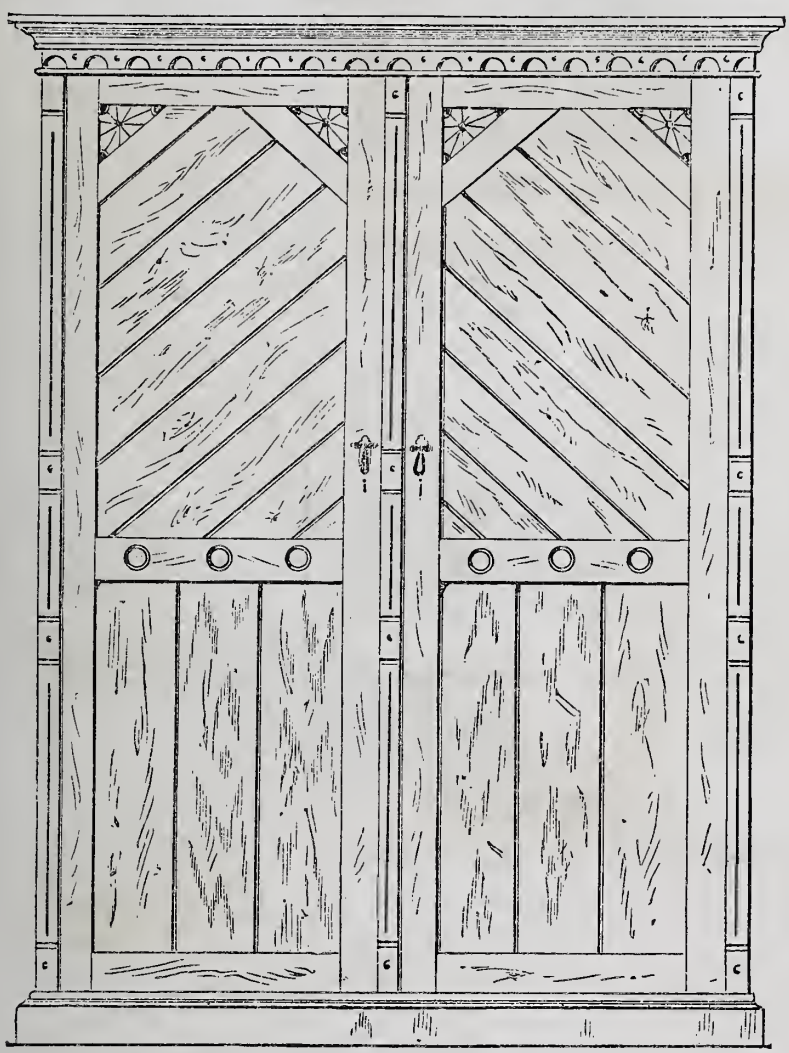


Fig. 2.—Front Elevation.—Doors Closed.—Approximate Scale, ¾ Inch to the Foot.

THE ART WORKER. A journal of design devoted to art and industry. Size, 11½ by 14½ inches. Vol. I., complete. Plates 1 to 94, inclusive. Published by J. O'Kane. Price, $12.

During the year 1878 Mr. O'Kane published in monthly parts the plates contained in this volume. They have since been arranged in a single portfolio and are now sold as a volume. It would be impossible in a brief notice of this work to give an adequate conception of the plates that are contained in it. Suffice it to say, however, that a large range of subjects susceptible of art treatment is covered, and the names of such well-known artists as Charles R. Lamb, Philip H. Ward, F. E. Hulme, Charles Booth, Arthur Halliday, J. O'Kane, Henry F. Kilburn; Roberts, Taylor & Wood, and others, appear as contributors. A number of decorative panels, suggestions in floral design, wall and ceiling decoration, stained and painted glass, painted tile decoration, sketches of furniture, studies for staircase halls, parlor mantel, room in a house in Fifth avenue, library table with details, and mantel and sideboard in oak, are some of the subjects. The volume is rich in suggestions and cannot fail to be of value to any who have occasion for such assistance.

THE ART WORKER—ALBUM OF MODERN FURNITURE. 55 plates. Size, 11½ by 14½ inches. Published by J. O'Kane. Price, $7.

This volume is a selection of plates from those contained in the complete work noticed above, the subjects selected being restricted to furniture, house decoration, &c. The plates are from a large number of prominent artists and architects, and are fine specimens of contemporary art, useful alike to those who are designing buildings and to those who are considering the subject of furniture.

THE ART WORKER—ALBUM OF DECORATION AND ORNAMENT. 45 plates. Size, 11½ by 14½ inches. Published by J. O'Kane. Price, $6.

The volume first noticed bearing this title is divided into two parts, one being devoted to furniture, &c., as we have just described, and the latter being restricted to studies in decoration and ornament. The 45 plates contained in this volume are specially adapted to those who are studying or making use of designs, whether in stained-glass work, house decoration or in other directions. The plates are selected from the work of a large number of prominent artists and decorators, and are well adapted to the purpose for which they are intended.

FARM ARCHITECTURE. By E. C. Gardner. 47 pages, pamphlet form. Published by Clark W. Bryan & Co. Price, 15 cents.

This little work is a lecture on farm architecture, houses and barns, delivered at the annual meeting of the Massachusetts State Board of Agriculture, 1880, by a well-known writer on architectural subjects. Many of our readers are familiar with this author's works—"Homes, and How to Make Them," "Illustrated Homes," "Home Interiors," &c. The lecture is entertaining, as well as practical. A number of illustrations are introduced showing progressive features of architecture, how old buildings can be changed to adapt them to modern requirements, with many suggestions that will be found very useful to those living in the country, and especially to those contemplating new houses. Concerning the farm house of the future, the author says: "It will be built mainly of bricks or stones. It will be broad and not high. The windows will be large. Shade trees will stand at a respectful distance, allowing the sun to rest upon it in healthful benediction. Each room will have an open fire-place, wisely contrived to give the greatest amount of heat and ventilation with the least consumption of fuel. A steam boiler, which is only a scientific tea-kettle, will hold a slice of the summer months beneath the roof all winter long. Sunshine and good cheer will prevail from cellar to attic, and from outer courts to innermost chamber. The roof will not leak—the chimney will not smoke. Rats and mice will not raise armies and fight battles in its hidden cavities. The kitchen will be a workshop fully equipped—a studio in which the fine art of cooking will be learned and practiced. There will be a private room for every adult and every child old enough to take care of a room. There will be a library full of books; a sitting-room so cosy, so interesting, so homelike and charming, that the parlor, if there happens to be one, will be literally left out in the cold." Taking this view of the case, and contrasting it with the actual condition of things in farm houses of the present day, our readers will agree that there is much yet to be done before the ideal farm house will be built. However, progress is being made, and the tendency of events is in the direction that the author points out. His picture is certainly a consummation devoutly to be wished.

CHEAP DWELLINGS.—A series of neat and comfortable city and country residences, illustrated and described by carefully prepared plans and specifications, and accompanied by reliable estimates of cost. Published by the San Francisco Bulletin Company, San Francisco, Cal.

Some time since the *Evening Bulletin* of San Francisco, in an enterprise undertaken in the interest of its readers, commenced the publication of a series of plans of city and country residences, together with such particulars as are usually required by those about to build. This series of articles appeared in its columns during last year. Since their appearance they have been gathered into a pamphlet of some 55 pages, exclusive of the plates containing the elevations and plans. The studies are calculated to meet the wants of a large portion of the growing community of San Francisco and neighborhood. While the plans have general interest for builders, they are of special value to those on the Pacific Coast. The well-known architect, Mr. John C. Pelton, Jr., of San Francisco, is the author of the plans, specifications and estimates contained in this volume.

SAWS. The History, Development, Classification and Comparison of Saws of all Kinds. By Robert Grimshaw. 280 pages. Size, 7½ by 10½ inches, illustrated with 354 engravings. Published by E. Claxton & Co. Price, $4.

We noticed the first edition of this work when it appeared some two years since, and accordingly a review of it at this time is hardly necessary. The principal difference that distinguishes the second edition from the first is additional matter in the way of a supplement. It is hard to understand just what the author had in mind when he decided upon the arrangement that he has followed in this volume. The work proper is restricted to 94 pages, following which are no less than 13 appendices, after which is a chapter called Addenda, which brings the volume up to 160 pages, the size as originally published. The remaining part appears under the head of a supplement, and includes an alphabetical subject index. Within the covers of this work there is no doubt a large amount

of useful information. It needs digesting and better arrangement, however, to be of any special advantage to the mechanic. The illustrations are largely from manufacturers' catalogues, and therefore in many respects are incongruous, taking one portion of the book with another. In the supplement, attention is given to special materials and the teeth adapted to the same, to filing, setting, swedging, gumming, together with considerations of emery wheels for use in keeping saws in order. Various forms of saws are also discussed. Throughout, the volume reminds one of a scrap-book in which miscellaneous clippings on the subject of saws have been pasted from time to time, with very brief notes by the compiler.

THE MODERN HOUSE CARPENTERS' COMPANION AND BUILDERS' GUIDE. By W. A. Sylvester. 114 pages, illustrated with 35 full-page plates. Size, 4½ by 6¾ inches. Published by A. Williams & Co. Price, $1.25.

The publishers, in their announcement of this work, state that many mechanics have wondered why some practical carpenter did not get up a handbook on carpentry, for the coat pocket, containing rules and illustrations for doing such jobs of work as are constantly required, with reliable information to assist in estimating the cost, together with other matters essential to carpenters and builders, and one that could be sold at a price within the reach of every workman. The volume offered is an attempt to supply this demand. By the title-page of the work we learn that it contains rules for getting the lengths and finding the bevels for rafters for pitch, hip and valley roofs; the construction of French and mansard roofs; several forms of trusses, stairs; splayed work, circular work, &c.; a table of braces, sizes and weights of window-sash and frame for the same; table of board, plank and scantling measure, &c. The volume commences with some plain geometrical problems which, by their character, naturally lead to practical problems in carpentry. The first plate in this portion of the book is devoted to different methods of splicing timbers. The next plate shows a plan of flooring, while the two following it show the arrangement of timbers in the ends and sides of a two-story and attic dwelling house. The use of the square in obtaining bevels of rafters, &c., is briefly referred to. Under the chapter heading of "Builders' Estimate," a number of useful particulars are given that will facilitate calculations in matters of this kind. A number of convenient tables are presented, together with particulars concerning many of the materials that are used in building. The concluding chapter in the work is devoted to mathematical rules, arranged in a manner to be convenient for the mechanic. Taken all in all, the book contains a great deal that is necessary to know upon the part of the mechanic and contractor, and it seems to be arranged in handy form and well calculated to meet a want long felt among builders generally.

Error in Scale.

In the October number of *Carpentry and Building*, in the article on strain calculations, page 189, an annoying typographical error occurred in the specification of the strain diagrams which we solicited from our readers. The error was not noticed until after our November number was upon the press, and accordingly this is the first opportunity we have had for correcting it. According to the article as printed, strain diagrams, in order to be noticed, were to be on a scale of 1000 pounds to the inch. This undoubtedly has seemed a very unreasonable requirement to those of our readers who have given the subject any consideration, as it would necessitate a sheet of paper some 17 feet in length. We have no desire whatever to receive diagrams to that scale. The omission of a cipher in the figures of the scale has caused all the trouble. The scale intended was 10,000 pounds to the inch, which would bring the diagrams to a reasonable size.

Great interest attaches to the subject of calculating strains, and as the proposition contained in this article was in the interest of our readers, being in the direction of finding what was actually needed in the way of additional information upon this subject, we trust that a number of our readers will respond and send in diagrams for criticism. We have made no limit of time, and will wait a reasonable interval before publishing what has already been sent, in order that those who take part in the contest later may have an equal chance. We trust that this correction, tardy though it be, will remove any misapprehension under which our readers may have been laboring, and induce some of those to send in diagrams who have been discouraged by the unreasonable conditions that seem to have been imposed by the original invitation.

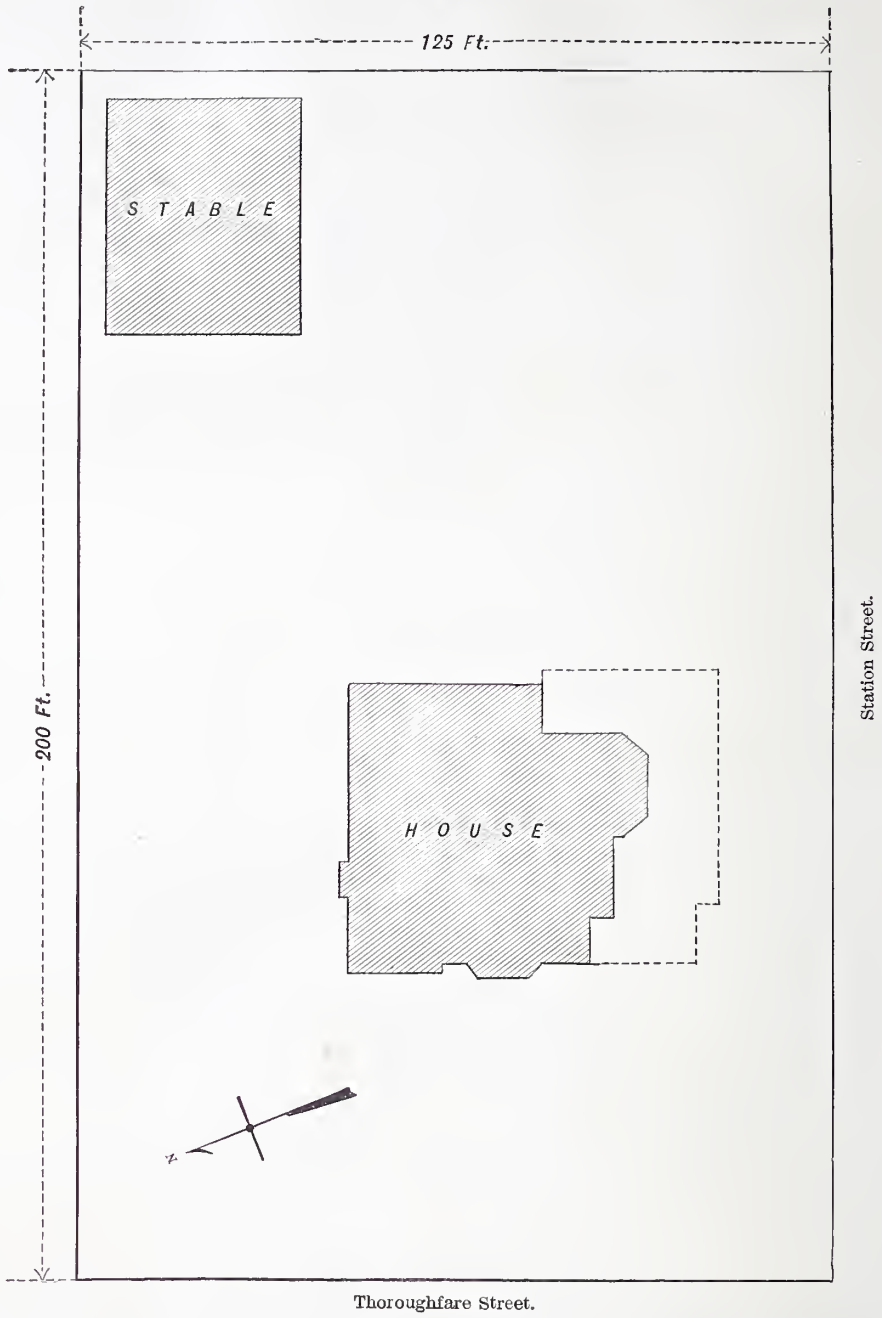
It is stated that the autumn coloring of the leaves of the maple, oak and other trees on the American Continent is not due to the action of frost, but to certain chemical changes which accompany the ripening of the leaves. American maples taken over to Europe will perfect their foliage for a few years—that is, the brilliant coloring will be put on—but they rapidly lose the habit, and in a few years the leaves fall from the trees while still green, according to the habit of the European species. Mr. T. Meehan, the well-known Philadelphia horticulturist, now says that in the New Jersey marshes there are many trees of European species which, though failing to color their leaves at their home, manage to put on the most brilliant hues here.

A Study in Suburban Architecture.*

BY AN ARCHITECT.

Preliminary Plans.

My latest commission, I fear, will prove more perplexing than the generality of work in the way of domestic architecture, for Mrs. Archie and myself have decided to build a house for ourselves. The word "architect" is so often mispronounced that a friend, a neighbor of ours, has suggested that we style ourselves Mr. and Mrs. Archie. Acting upon the suggestion, I shall so use our names in this paper. The planning of houses for other people is a simple and everyday occurrence. The planning of one for ourselves necessitates playing the double role of architect and client. Perhaps it would not be a bad idea to place this particular work in the hands of some other architect, and thus reserve for myself the high office of critic. However, our neighbors have a right to be curious as to what kind of a house an architect would build for himself. I feel that



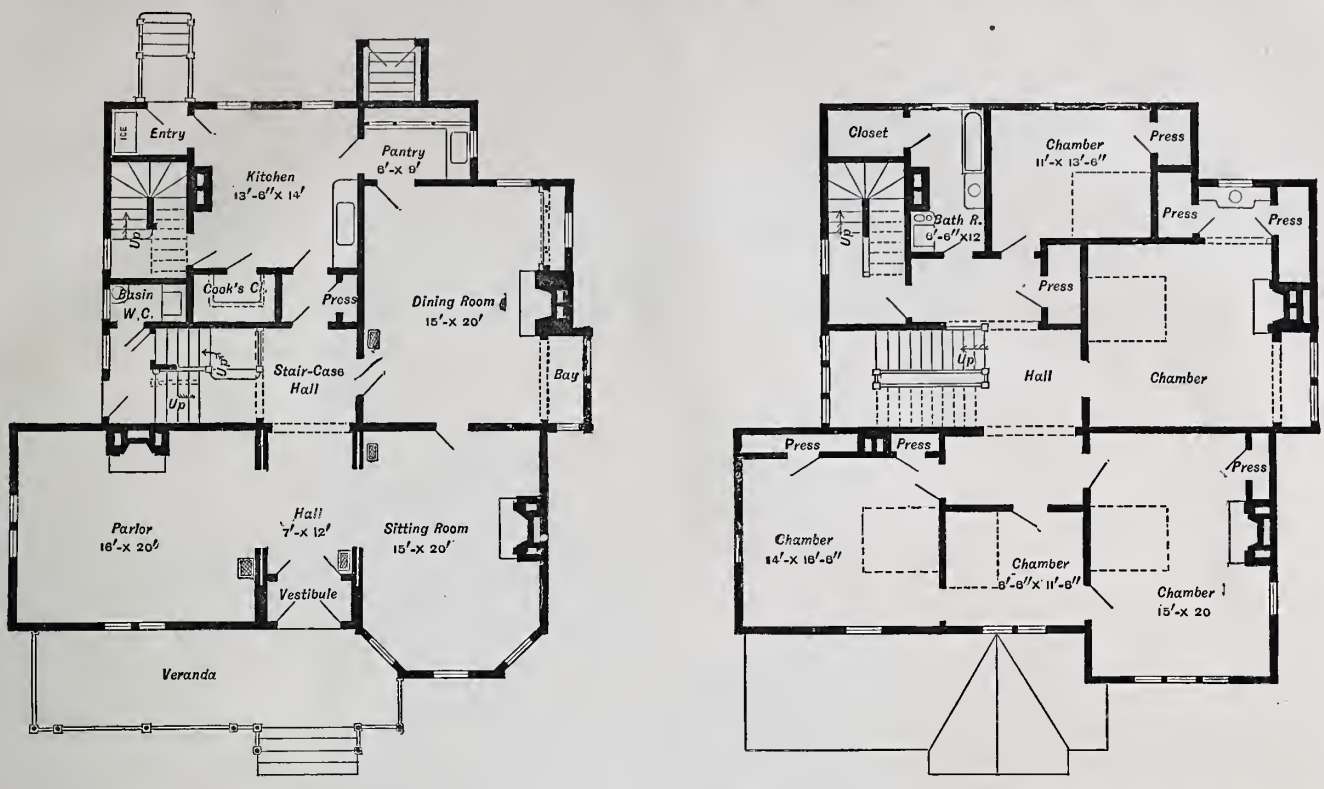
A Study in Suburban Architecture.—Plan of Lot, Showing General Location of House and Stable.—Scale, 1-32d Inch to the Foot.

* The illustrations in this series of papers are from drawings prepared by Messrs. Gould & Angell, architects, of Providence, R. I.

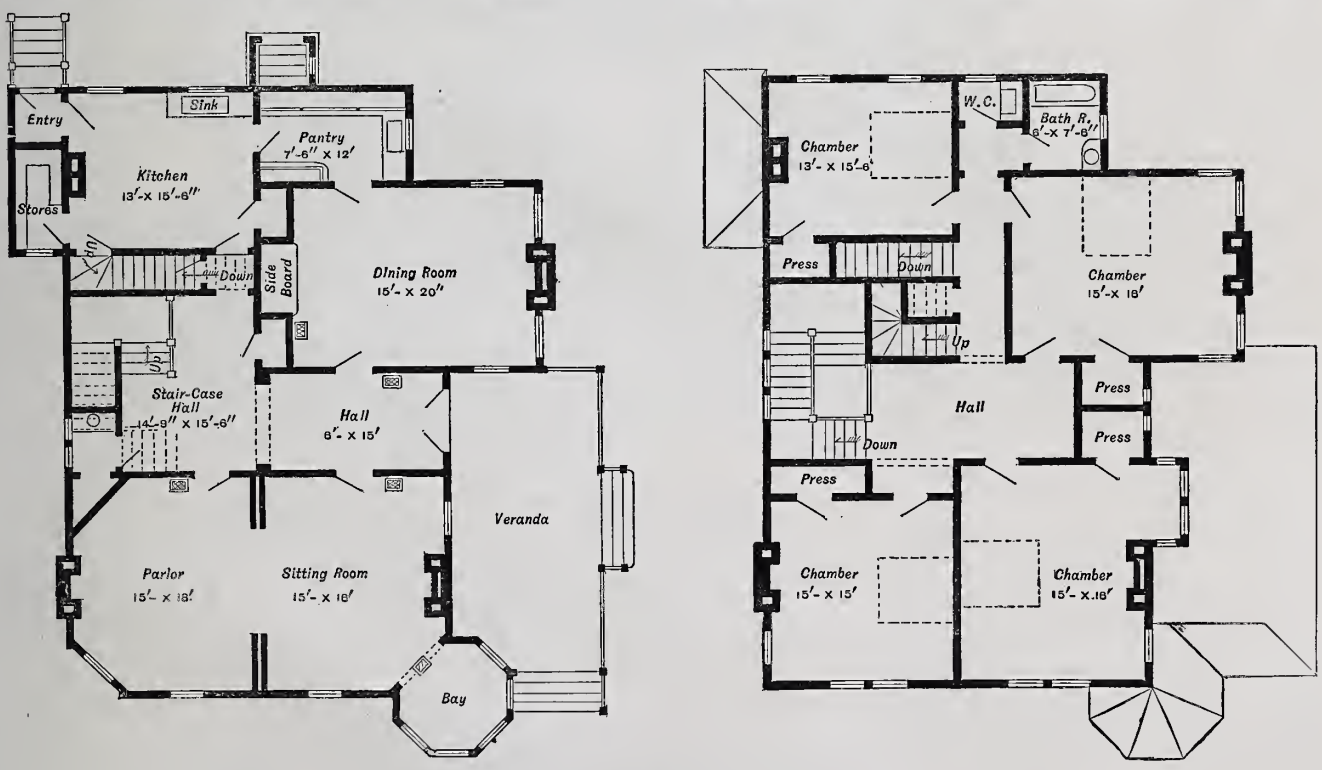
their anxiety should be gratified, and so, with the help of Mrs. Archie, I shall endeavor to make the design of our house a recreation during the long winter evenings.

The first important step, the choosing of the site, has already been taken, for we are not like the man who, in presenting his ideas of the house he desired to build, in answer to a question by his architect with reference to the site, replied that he was hardly decided as to the situation. In fact, he didn't know whether he should build in the city or the country. The site we have selected is situated in a thriving village a few minutes' ride by road from a large city. The lot is a corner one; has a frontage of 125 feet and is 200 feet deep. Thoroughfare street in the front is 75 feet wide between curbs, and Station street, at the side, is 55 feet wide. The latter runs nearly east and west, and has a fall of about 2 feet in 50. The surface of the lot is somewhat irregular. The soil is of a porus nature and shows little or no evidence of clay or large rocks. Several noble trees have taken deep-rooted possession of the lot in such positions as to form a beautiful background for our house-picture. We are inclined to retain these natural beauties if we can do so without injury to the house. In front, the house will look upon a broad and pleasant street not devoid of architectural features, for others have realized the excellence of the situation. Accordingly, we shall find ourselves in good company—old company, too, for many houses on the street have seen more than half a century. To the south and east we will look down into a beautiful valley, beyond which in the blue distance toward the sea lies the great city.

We are unanimous in the decision that we shall not have a mansion. We desire plenty of room, but none for which there is no use. There is no desire in our hearts to compete with our neighbor over the way in point of cost or style. We care not if all or only part of his windows run to the floor. We have not as yet counted the number of gables that go to make the many angles in his roof, with the determination of having one more in our combination or perish in the attempt. We are quite sure, however, that there is a



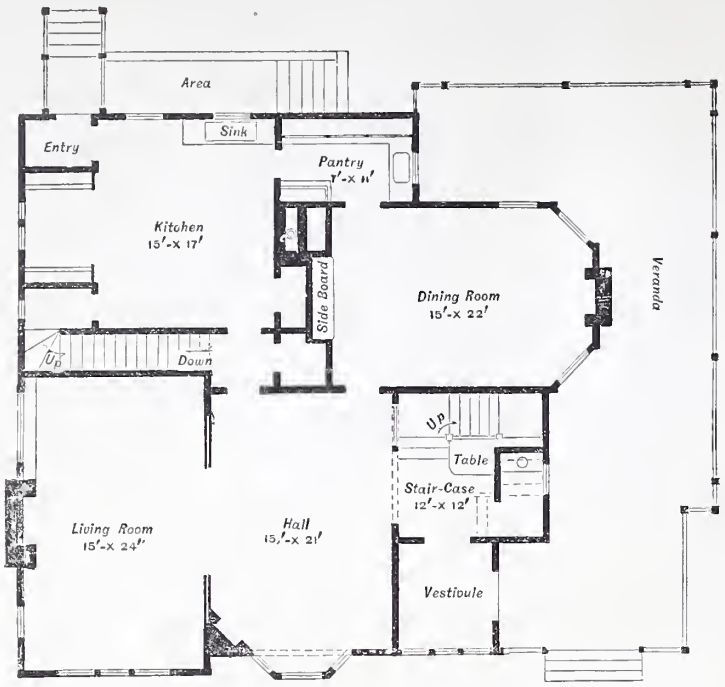
First and Second Floor Plans. No. 1.—Selected from the Architect's Portfolio for Consideration.—Scale, 1-16 Inch to the Foot.



Floor Plans. No. 2.—Being the Results of Study of the Foregoing.—Scale, 1-16 Inch to the Foot.

A STUDY IN SUBURBAN ARCHITECTURE.

grand view to be had from his tower, but we are at present perfectly willing to make our house so low and modest in outline that he shall not be shut out from the beautiful blue distance.



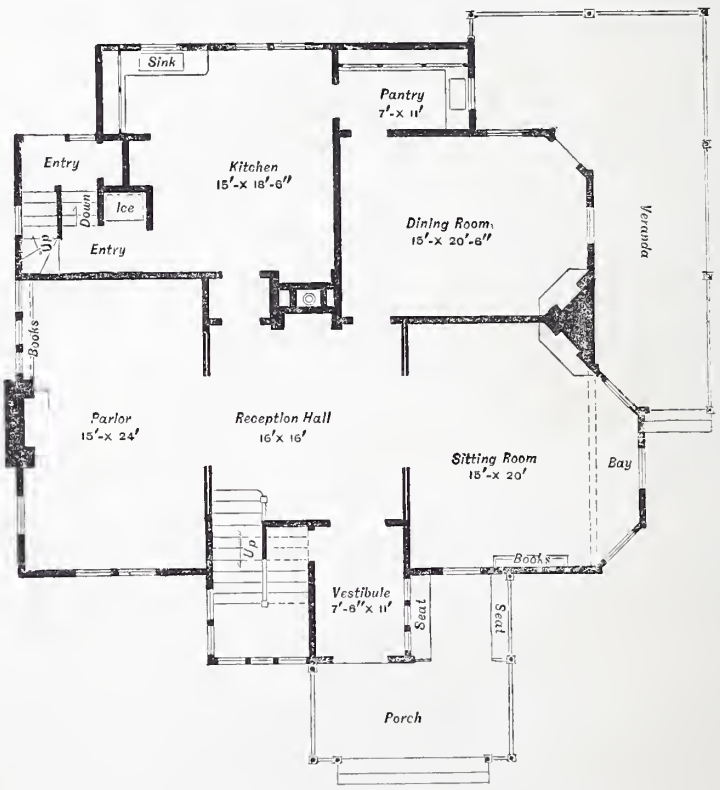
A Study in Suburban Architecture.—The Effect of Enlarging the Hall in the Preceding Plan.—Scale, 1-16 Inch to the Foot.

To commence with, we select from my portfolio plan No. 1 as a suggestion of about the number of rooms we desired, although we cannot offer it as the best solution of the problem before us. This is simply a proof that a well-arranged plan appears well arranged only when one has in mind the position which it was planned to occupy. Rarely can one find a ready-made plan suited to his wants. Upon examination we believe that the several rooms are not badly placed, and that they are convenient in themselves. The veranda seems not at all suited to our lot. With the suggestions thus offered by plan No. 1, we set to work to produce something that more nearly meets our requirements. The result of our work is plan No. 2. In this the veranda is decidedly better, and the chimneys in parlor and sitting-room are better disposed than before. However, we want more plans before we criticise. Just here it occurs that we should like to consider the effect of enlarging our hall until it becomes a reception-room. This results in plan No. 3. This arraugement shows a house without a parlor, a room which if kept shut nine-tenths of the time, as some parlors are, might as well be left out and the space appropriated for something more useful. We are not committed to this sentiment, however, for courting has not yet gone out of fashion, and the best room is still in demand. Still keeping the reception hall in mind, we easily turn our ideas in the direction of plan No. 4. Here we pause for reflection. We cannot decide in a moment. A collection has been made in a few points in planning. There are obvious defects in all the studies presented. Perhaps we can rid ourselves of all the mistakes by patient and careful study; at least we can eliminate some of them. Let us, then, put them by for awhile. When we again look at them we shall be better able to judge of them from having had time to think the matter over.

Lightning Rods.

There are few things whose uses and advantages are more misunderstood than lightning rods, and in the country, where the danger from lightning stroke is always supposed to be greater than in cities, all sorts of notions are prevalent as to the proper material and the best method of erection. We have not room to go into all the reasons for devising various modifications of lightning rods, but the following rules are the outgrowth of a lightning-rod conference held in Europe, at which some of the very best scientific talent was present The materials of the rod should be copper or iron. If copper, it ought to weigh not less than 6 ounces per foot run. It may be in the form of a rod or rope of stout wires, but in the latter case no wire less than 1-10th inch in diameter ought to be used. If the material is iron, it is considered that it should not weigh less than 2¼ pounds per foot. Screw joints or riveted joints made with clean metal aud thoroughly soldered are the only ones which are safe. A riveted joint soldered has been approved. After some deliberation it has been concluded that the upper terminal ought not to have an angle less than 90°, and a foot or so below the extreme point a copper ring should be screwed on and soldered, and in this ring three or four sharp copper points, each about 6 inches in length, should be screwed and soldered. The whole ought to be gilded or nickel-plated, so as not to be easily corroded. In the rules employed by the British Government for the Department of Explosives the rule is adopted that the space protected by a conductor is equal to a cone, the radius of whose base is equal to the hight of the conductor from the ground. There ought to be no abrubt curves or corners in the rod, which should be carried to the ground with as few bends as possible. The next rule is one which will cause a great deal of comment both by lightning-rod men and by those who have not studied the matter very thoroughly. It is that no iusulators should be used of glass or other non-conducting substances. The rod ought to be attached to the building by fastenings of the same metal as itself. The old rule was to fasten conductors by wooden cleats, but when the conditions are all thoroughly considered it is easy to see that if the rod is not of sufficient size to give the best and easiest path for the electricity from the clouds to the earth, it is impossible to prevent lightning leaving the rod by such inefficient means as a glass insulator.

The best place for a rod to reach the earth is the side most exposed to the rain. All metal work, spouts, gutters, iron doors or iron roofs ought to be connected to the conductor by good metallic connections. The lower end of the conductor ought in all cases to have a terminal bed in damp soil, and hence the lower terminal ought to be placed in proximity to rain water pipes, drains or other water. Sometimes it is considered a good plan to branch the conductor and carry it downward through the earth to widely separated terminals. A sheet of copper 1-16th of an inch thick and 3 feet square, buried permanently in wet earth, makes a very good terminal. For iron conductors painting is absolutely necessary. To protect from theft, where a copper conductor is used it is not a bad plan to inclose the conductor in an iron tube for 10 or 15 feet from the ground. Examination and inspection are usually necessary. Unless, however, the person be acquainted with the inspector, little advantage is to be gained from this, and one's own eyes may be trusted to secure the desired result. What is wanted is a perfect metallic connection all the way from the point of the rod to a large area of metal buried in the wet ground, and this condition is absolutely essential to efficiency.

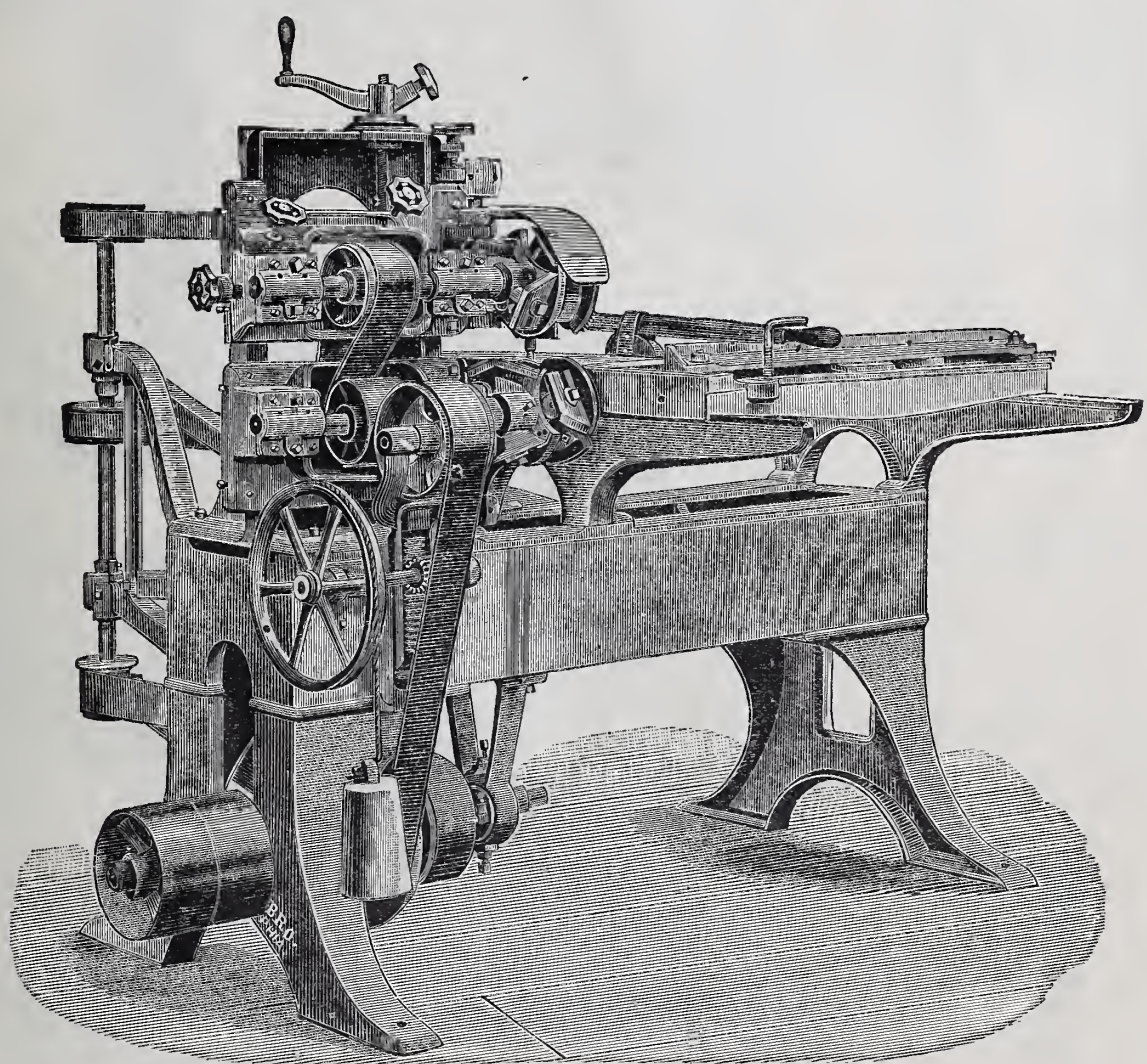


A Still Further Modification, Showing the Reception Hall Between Parlor and Sitting Room.—Scale, 1-16 Inch to the Foot.

NOVELTIES.

New Tenoning Machine.

The amount of attention that has been given to the design and construction of woodworking machinery would seem at first sight to leave but little chance for further improvement. Woodworking machinery in all probability ranks as high as any line of machinery made in the world in point of design, construction, economy of action and in numerous other desirable features. However, the records of the Patent Office show that continual progress is being made in the direction of improving this very important line of labor-saving devices The changes that are being made are for the most part in the direction of economy of material and of better quality in the work produced. Among recent improvements to which our attention has been called is that of a new tenoning machine, recently put upon the market by Messrs. Jos. O. Colladay & Bro., 626 Race street, Philadelphia, a general view of which is afforded by Fig. 1 of our engravings. The machine is built entirely of iron and steel, and, as may be seen from the engraving, is solid and substantial. One of the recent improvements incorporated in this machine, and which was patented only a few weeks since, is the device by which both heads may be raised or lowered together or separately. The copes are attached to the head-stocks on which the cutter heads hang, and need no separate setting. In other respects this machine has all the improvements and adjustments necessary for convenient and efficient use, and is a first-class tool throughout. The tight and loose pulleys are 9 inches in diameter with 4-inch face, and in operation are intended to make 900 revolutions per minute.



Novelties.—Fig. 1.—New Tenoner, Built by Jos. O. Colladay & Bro., Philadelphia.

Tripolith.

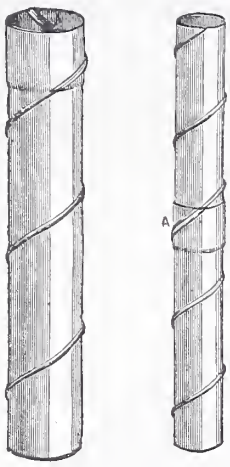
Tripolith is the name given by its inventors to a new binding material for builders, a substitute for lime, cement and plaster under certain circumstances, and which is composed of sulphate of lime, coke and oxide of iron in some form or other. To test its various qualities, the manufacturers, Messrs. von Schenk Brothers, of Heidelberg, Germany, have had a very thorough series of trials carried out with this material by the Imperial German Bureau for Testing Building Materials. These tests show that the material requires considerably less water to form a workable mortar than ordinary lime, while the time for setting can be regulated by adding more or less ordinary slaked lime. Thus, while tripolith mixed with sand only sets in 10 to 15 minutes, an addition of slaked lime may easily increase the time required for setting to 60 minutes. The specific gravity of tripolith is lower than that of plaster. The former is 1.678, the latter 1.696. The tests which were made show that the tensile strength increases considerably after a long exposure to the atmospheric air. It amounts to 100 per cent. in from 70 to 90 days in mortar composed of one part of tripolith and one of fine sand, and to 189 per cent. for the same time in mortar composed of one part tripolith, one part fine sand and one part slaked lime. Compared with the tensile strength of lime and cement, the results obtained with tripolith are highly satisfactory. The compression tests point out for tripolith a position between lime mortar and cement mortar, but since after being fairly set it acquires about the same crushing strength as ordinary bricks, no more would be needed for general use. In setting, tripolith mortar loses in weight, and when placed in water does not absorb the latter so rapidly as ordinary mortar does. Its adhesion to brick, stone and other materials is very considerable, and the tripolith mortar does not either reduce or increase noticeably in volume when setting. For facing and plastering this material appears excellently suited. It is easily handled and smoothed while soft, adheres well to brick or stone surfaces, and attains far greater hardness than plaster of Paris, and oil or other colors adhere to it well.

Spiral Pipe.

In various articles which have appeared in different issues of this journal we have directed the attention of builders to sheet metal work, and have pointed out in several important particulars how builders may serve their own interests by buying their sheet metal work direct, and either making application of it to their buildings themselves, or by hiring tinners and sheet metal workers the same as they hire carpenters or bricklayers at present. One of the most important articles now in the market, viewing it from the standpoint of availability for the builder's purpose, is the spiral lock-seam pipe manufactured by the Boston Spiral Tube Works, 250 Charles street, Boston, the general features of which are clearly shown in the engravings presented herewith.

Spiral pipe, both lock-seam and riveted, has been upon the market for some time, and it is already partially introduced. There are, however, some features to which attention may be called with advantage. In the first place, however, we should say that litigation which has been in progress for some time has finally been settled, and as the cut-throat competition incident to trade conducted by rival manufacturers has been removed, the pipe that is now upon the market is of excellent quality, and every precaution is being taken to intelligently adapt it to the requirements of the building public. It is natural that tinners and sheet-metal workers generally should be prejudiced against a machine-made article, from the mistaken assumption that its use will necessarily diminish the demand for their own labor. On the other hand, it is undoubtedly true that machine-made goods in many respects are far supe-

rior to those made by hand in a small way, both in point of finish and durability. This latter point, we think, is well made with reference to the pipe we are about to describe. The joints or locks are made by neatly-working machinery, and are closed very carefully. In the case of galvanized pipe, the galvanizing is not done until after the pipe is made, and, therefore, the molten zinc, in filling all cracks and interstices, adds an additional element to the quality of the pipe. The special advantages to which the manufacturers direct attention, as distinguishing this pipe from hand-made pipe, may be enumerated as follows: The spiral seam running completely around the pipe acts as a guard and brace, stiffening and protecting it. The same pressure that would tend to open a seam



Novelties.—Fig. 2.—Ritchie's Spiral Lock Seam Pipe.

that ran on one side of the pipe, will not be sufficient to burst a seam running spirally around it. The pipe can be made of any desired length, inasmuch as a continuous strip is used in feeding the machine that makes the pipe.

The usual length in which the pipe is shipped is sections of 10 feet, but this is varied to suit requirements. The advantages of pipe upon a building in 10-foot lengths, as compared with pipe made by hand, will be at once apparent by considering that the nearest approximation to a 10-foot length in pipe of ordinary construction would be a 9-foot length made by soldering 3-foot

Fig. 3.—Pipe Fitted with Flange Connections.

lengths together. Soldered joints in pipe of this character are the weakest places about it, whether it be employed for ventilating purposes or as conductor pipe. The solder is continually breaking, letting the pieces come apart or causing very annoying leaks. Another advantage to which the manufacturers direct attention is that the pipe is perfectly round in section and handsomer than any hand-made pipe. Roundness is an advantage, especially where it is desirable to fit the pipe neatly in woodwork, making it possible for the builder to cut his hole exactly the right size to fit the pipe closely. While 10 feet is the standard length in which this pipe is made, we understand that the manufacturers propose also to make lengths of 5, 6, 7 and 9 feet, so that a judi-

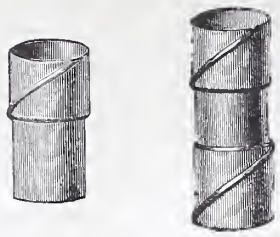


Fig. 4.—Single and Double Hub Coupler.

cious selection of lengths in ordering the material for any building will save necessity of cutting. The cutting, however, is not such an important item when the form of coupler supplied by the company is considered. This is clearly shown in Fig. 4 of the engravings. Another feature to which the manufacturers direct attention, and which still further adapts the pipe to use by builders, is that one end of each length is enlarged, and in operation a groove is formed on the inside so that the seam on the outside of another length screws into this groove. By this means a secure coupling is formed without solder. As neither end is diminished, this is better than an ordinary slip joint.

Referring to the engravings, Fig. 2 shows the general appearance of the pipe, the cut on the right representing two sections of the pipe joined as we have just described. Fig.

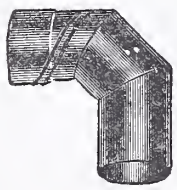


Fig. 5.—Three-Piece Elbow.

3 shows a length of pipe fitted with flange connections, a form in which it is occasionally used. Fig. 4 shows a single and double hub coupler, while Fig. 5 shows one of several forms of elbows which are provided. Fig. 6 represents a conductor cap, while Fig. 7 shows a cast-iron shoe or bottom of a style adapted to use in connection with spiral pipe. Throughout the manufacturers seem to have given special attention to the requirements of builders, and to the use of their pipe by those who are not tinners. In reference to cost, the manufacturers state that this pipe, together with the fittings, can be sold at a price equal to the cost of making hand-made pipe. By using this pipe, therefore, the builder has the opportunity to save to himself the profit at present paid to his tinner.

An Improved Wheel Pipe Cutter.

A new and improved wheel pipe cutter, shown in the accompanying engraving, Fig. 8, is now being turned out by D. Saunders' Sons, of Yonkers, N. Y., and will undoubtedly be found well adapted to meet the requirements of steam and gas fitters. As builders frequently have occasion to cut pipe, its notice in this connection is entirely appropriate. Among the various advantages which the

Fig. 6.—Conductor Cap.

manufacturers claim for the tool we would mention its simplicity, strength and lightness, and the facility with which it can be adjusted to the various sizes of pipe. As seen in the engraving, the stock is provided with rollers, on which the pipe rests, and by means of which a rolling instead of a sliding motion is produced, thus appreciably reducing the friction. The burr which is raised by the wheel in cutting the pipe is, moreover, effectually removed, leaving a comparatively smooth and clean edge after the completion of the operation. The hinged block, with the cutting wheel, is so arranged that it

Fig. 7.—Cast Iron Conductor Bottom, Adapted to the Style of Ritchie's Spiral Pipe.

cannot be detached and mislaid, and is moved to its work by turning a rod which is provided with a screw-thread and works in a nut, as shown. The handle with which

Fig. 8.—Saunders & Sons' Pipe Cutter.

this rod is provided is a hollow malleable-iron casting, firmly secured by riveting, so that it will not come off with ordinary usage. All the wearing surfaces, rollers, pins and cutting wheel, are made of the best tool steel, which is hardened so as to increase the durability and reduce the friction to a minimum. Pipe having a diameter of 1 inch or more can be operated upon, and the time occupied is said to be exceedingly short. The several

parts, moreover, can be duplicated, and no delay in the work need therefore be experienced when one of them becomes worn out or is broken. The tool, as already stated, combines simplicity with strength, qualities which will greatly contribute to its extensive use.

Metal Decorations.

This issue of *Carpentry and Building* will reach our readers just about the time that holiday decorations are being considered.

Fig. 9.—Metal Anchor for Holiday Decorations, Colored to Imitate Natural Leaves and Flowers.

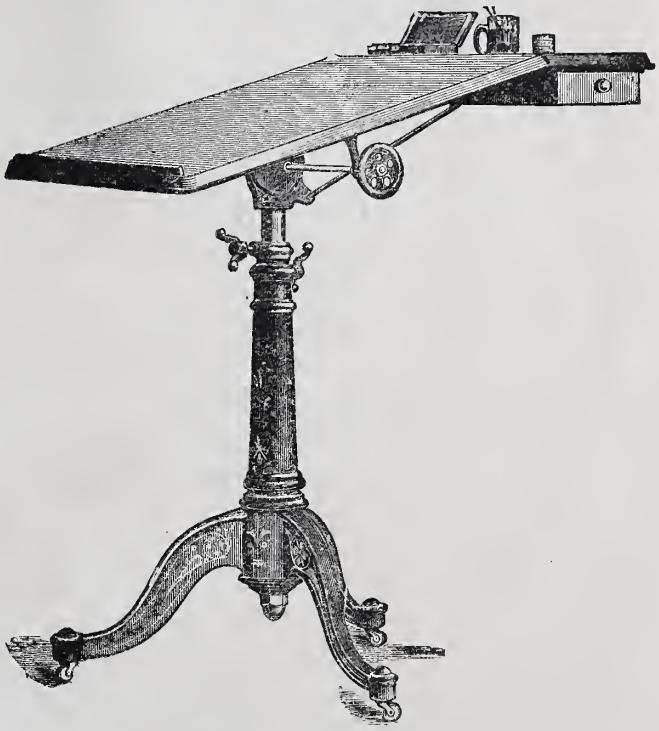
Some remarks therefore on some new goods in this line will be appropriate. The habit of trimming churches, halls and residences at this season of the year is a very pretty one, but the matter of obtaining suitable devices in evergreens, leaves and flowers is frequently attended with considerable trouble. Accordingly a very large circle of our readers are specially interested in a line of goods which has recently been put upon the

Fig. 10.—Metal Wreath.

market, the introduction of which will tend to reduce these difficulties. Metal decorations for purposes of this character have long been manufactured abroad, and have been imported to a limited extent. Quite reeently their manufacture has been undertaken in this country by the Boston Metal Wreath Co., of Boston, Mass. The New York agents are Messrs. A. B. & W. T. Westervelt, 102 Chambers street, to whom we are indebted for Figs. 9 and 10 of our illustrations, which show two designs out of a large number that are manufactured in this manner. A metal frame is used, over which leaves, pressed out of sheet metal in very finely-worked dies, are fastened by solder or otherwise. Flowers, as will be seen by the engraving, are introduced wherever the design makes the same appropriate. The leaves and flowers in turn are colored in close imitation of natural forms, so that, looked at from a short distance, these metal devices are hardly distinguishable from the natural forms which they counterfeit. In many sections of the country carpenters are frequently called upon to superintend or take charge of decorations of schoolrooms, halls and the like for special occasions. Accordingly, a line of goods of this character is of importance to them from the facility with which they may be used, and from the further fact that the decorations, when removed from one building, are still in shape to be recombined in other forms on some future occasion. Another use to which these goods may be put, and which still further indicates the value of metal applied in this form, is that of cemetery decorations. A circular before us, issued by the company above named, states that decorations of this character are quite extensively used in all the principal cemeteries of Europe. For this purpose some of the designs are furnished with means of attaching to monuments or for supporting above the ground. One design in particular is entitled a "G. A. R." wreath, intended for Grand Army posts, and in its general features is similar to Fig. 10 of our engravings, supplemented by two flags, the whole being supported by a staff. Among the designs that are furnished in goods of this kind may be mentioned crosses, stars, sickels, mottoes, special emblems, &c.

Adjustable Drawing Stand.

An adjustable drawing stand, manufactured at the Washburn Machine Shop, in connection with the Worcester County Free Institute of Industrial Science, Worcester, Mass., is illustrated in the accompanying engravings. It is well adapted for use in schools and drawing classes, by artists, draftsmen, engineers and artisans generally. The construction is readily understood by reference to the engraving. The stand can be fixed at any required hight, so that it may be used in either a sitting or standing position. By turning back the screw at the right it is allowed to rotate so that either side can be toward the front. A shelf or ledge for the instruments is attached to the back of the table in such a manner that it is always level, whatever inclination is given to the desk. Fig. 11 shows the table fixed at a slight inclination. In the diagram it is shown by the heavy lines in about the same position, while the dotted lines represent it horizontal and also vertical. When the table is nearly vertical the whole occupies but little space, and forms a very convenient easel. When used for this purpose, a neat attachment, not shown in the engravings, is furnished for holding the picture, and the adjustments are so simple that a mere touch is sufficient to effect an entire change in the light which falls upon the work. Under the shelf designed for holding instruments, color cups, &c., two drawers are provided which are very convenient for holding working materials. The table and drawers are constructed of black walnut or other appropriate wood nicely finished. The tripod, hollow standard and sliding spindle are of cast iron, and the working parts are well finished and very easily operated. The stand complete weighs 55 pounds, and is sufficiently firm to support a drawing board 44 inches square, without inconvenience. In the lowest position the table is 33 inches high, and may be elevated to 44 inches.



Novelties.—Fig. 11.—Adjustable Drawing Stand.—General View of the Stand in Use.

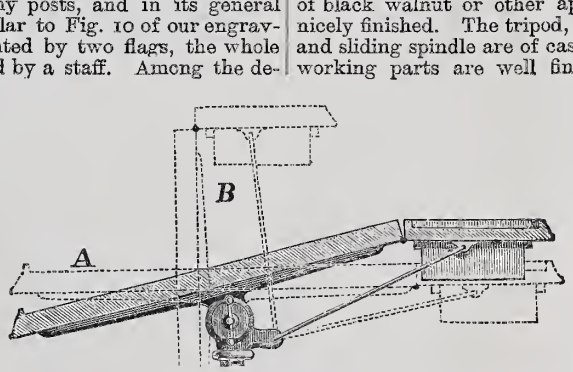


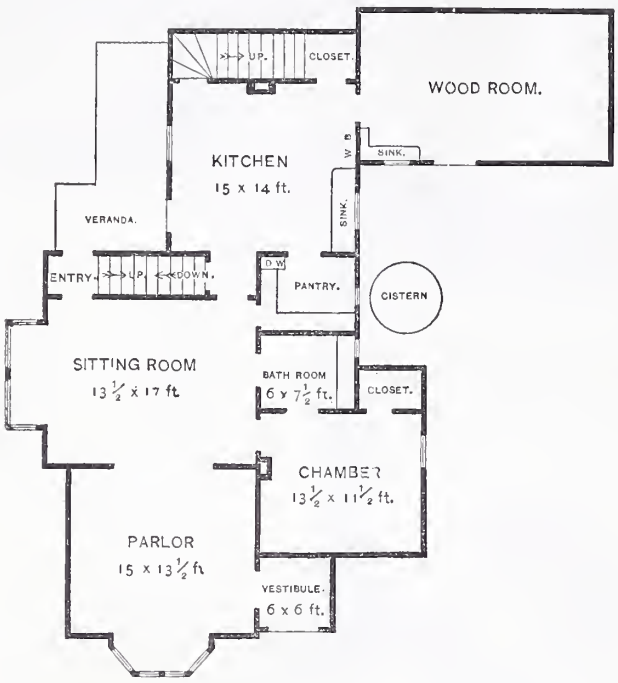
Fig. 12.—Diagram showing the Stand in Different Positions.

If we may judge from the reports that reach us, Anoka, Minn., has not been far behind other cities of her size in the matter of building operations. The Anoka *Herald* states that over 500 houses have been put up in that place during the past season.

Planning of Farm Houses

BY B. S. HOXIE.

I have been invited by the editor of *Carpentry and Building* to prepare an article upon the subject of farm houses, a topic rarely written upon in publications of this character. I cheerfully comply with the request, not because I am so well qualified to instruct, or because I expect to offer plans or suggestions which shall be faultless or above criticism. From an experience of many years as a builder, I find a great lack of systematic planning among the farmers when it comes to the erection of a house. If we are to take the description of the thought as we see it embodied in the country homes that dot the landscape, it is not strange that the dwellers in village and city houses of comfort and beauty should call them places to live in instead of homes.



Farm Houses.—Fig. 1.—First Floor Plan.—Scale, 1-16 Inch to the Foot.

I have read somewhere that at one time it was considered a penal offense in Greece for an architect to construct a public building of any kind which was not pleasing to the eye, completely adapted to its use, and which combined harmony in its various proportions. I am not sure but that it would be quite as well for us to adopt this law as it is to study their designs. If this were the case a modern farm house would contain conveniences if it did not embody beauty of design, and our public buildings strength enough to withstand their own weight if they had no other desirable features. Now and then we see a plan by a city architect made for a farm house which, in its arrangement of rooms and general details, is as illy adapted to the requirements of a farmer's home as the farmer's barn would be for a city livery stable.

The man who wishes to pile up brick and mortar as an investment consults the best architect and examines plans and specifications, but the farmer generally employs the nearest carpenter to build him a house, and quite often he selects the one who works for the least wages. The farmer, of course, has some idea of how many rooms he wants in a given space. He lets the job to the man who will inclose it and roof it for the least money, and then brags how cheaply he has built his house. It is done cheap, whatever may have been the cost. The city man who builds makes up for his lack of knowledge in architecture by engaging the services of one who does know, but the farmer often considers it a waste of time and money to pay for a well-matured plan or a design with specifications, to say nothing about an elevation of the proposed building. Farmers, in this manner, offer a premium for mediocrity by employing the cheapest, and, consequently, the poorest workmen. For this reason, quite as much as on account of lack of means to build, will unsightly, ill-constructed farm houses spread themselves out in the landscape of the roadside, marring the beauty of nature, instead of bending to it. I am ready to admit that this outlook is not an encouraging one to a practical builder who contemplates a course of study which shall enable him to design houses for farmers. It is to the general knowledge and practical skill of the house carpenter that farmers look for their work, and, accordingly, any improvement that is to made must be in the direction of information to this class in the community

It is often remarked by those from the country who visit friends in the village or city, especially the wives, mothers and sisters, "How nice, handy and convenient you do have every thing about your house to save work. I wish our house could be as handy." The farmer may say, perhaps, "It costs money to have all these things." Well! So it does, but on which side of the account does the profit or loss come in. The farmer buys his improved implements to save time and money, but rarely thinks that the time of the wife and daughter in their daily journeys to the woodpile, well or cistern is worth the saving. He rarely thinks of the extra steps to the cellar and pantry in the preparation of a single meal. He does not take into account the saving that would be accomplished if all the necessary adjuncts of the household were in closer proximity to each other. I have often seen the woodpile at a farmer's house two or three rods from the kitchen door and then not under cover; the well 10 or 15 rods away and sometimes down a steep hill, having been located there to save a few feet of digging. This alone makes miles of extra traveling in the course of a year. The cistern, if there was one, was provided with no other convenience for drawing the water than a pail and rope. Is it any wonder then that mother and daughter in such a farm house are tired out with the extra labor and drudgery of household duties?

The building of a good house by the thrifty farmer may perhaps have been long in contemplation. He may have considered how much money he intended to put into the structure, but the most important part of how to make it a home embodying comforts and conveniences, has been left entirely out of his calculations. I once built a house for a well-to-do farmer which cost about $1500. It had neither pantry nor closet on the principal floor. It is only proper to remark, however, in this connection that a wing is intended to be built at some future time which may contain a pantry. The house is lacking as much in beauty of design in exterior finish, as it is in convenience of interior arrangement. This is one of those houses of which the farmer was his own architect. He knew just about how much money he wanted to spend, and yet his house has cost him as much as a neat and convenient house would have cost all completed. It has cost as much as one that would have been an ornament to the landscape, rather than the half-completed structure which has thus stood for years.

A mistake that the farmer often makes, is that of imitating something that he has seen somewhere. He notices a house somewhere in his travels that, so far as the exterior is concerned, he thinks just suits him. In his attempt to have the carpenter copy from it, he finds that the location as to frontage and all its surroundings are quite different in the two cases, and when too late he discovers that he has made a mistake. More forethought, with the skill of a good builder, would have been better than all the after regrets for the defects discovered too late to remedy.

Frequently as much depends upon the location of a farm house and its buildings for pleasing effect as in the design of the building itself. The proper grouping together of the various buildings with the construction of ease of access is something that is frequently neglected. We often see the dwelling on one side of the public highway, while on the opposite side are spread out barns and various other out-buildings, to reach which gates must be opened and the dusty or muddy road crossed hundreds of times in the course of a year. I can conceive of no excuse sufficient for this flagrant lack of taste and convenience. I am well aware that it is easier to point out faults and defects than it is to correct them. We are apt to think, however, that our present mode of life and work is all right until we are taught a better way, and so many a farmer's wife has been content with her house because she had got used to it, and supposed, perhaps, that it was as handy as her neighbor's.

The room in which farmers' wives spend a considerable portion of their time is the kitchen. It should be one of the pleasantest rooms in the house, and if any apartment is to take a back seat, let it be the parlor. For the kitchen, let it be easy of access to the family sitting-room, chambers and cellar. Have the cistern pump and sink so near the cook stove and pantry that a space of 15 or

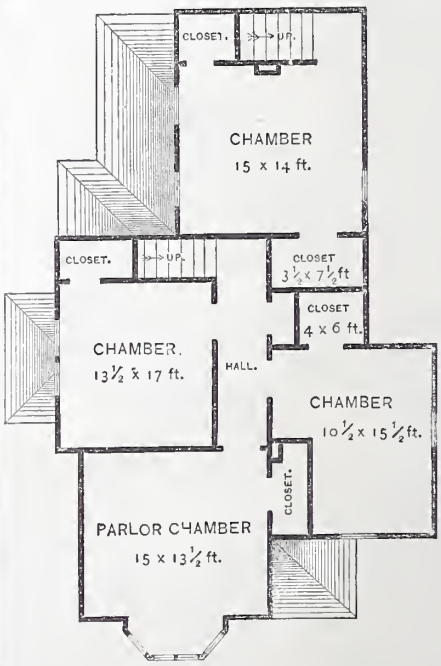


Fig. 2.—Second Floor Plan.—Scale, 1-16 Inch to the Foot.

20 feet will not have to be traversed three times a day, a thousand times a year, simply because no skill was exercised in the planning. Instead of going three or four rods to the woodpile, construct a wooden box in the partition between the woodshed and kitchen, if possible, so as to fill it from one side and

take it from the other. In the pantry, or near the pantry side of the house, construct a dummy or dumb-waiter, so that articles of frequent use during the day can be lifted from the cellar without the ascent and descent too often by means of the stairway. Arrange the washroom for farm laborers with a closet near by for every-day clothing. The tidy housewife will not care to have farm laborers wash at the sink where she washes the dishes. Let the kitchen open upon a broad veranda, and, if possible, select a building site where this part of the house will not be elevated more than two or three steps from the ground. At the front entrance for strangers and company, where the inmates of the house seldom come or depart, there may be as many steps as are necessary. Speaking of closets for the kitchen, have a closet or clothes-press for every bedroom in the house, and still another which may be of easy access for extra bedding not needed in the summer season. I have now sketched the plan for the kitchen. Will it be convenient? If so, arrange the other rooms of the house around it in such a way as to make them of easy access in proportion as their most common or ordinary use demands. The chimney, that inexpensive adjunct to the house which many builders do not know where to find a place for, have where it will accommodate a number of rooms, in case a stove should require to be placed in each. By all means have an ample flue, and have it as nearly straight as possible. By this means one large wood or coal stove can be made to warm a number of rooms where necessary. As farm houses are generally ventilated by lowering or raising a window-sash, I would by all means have them balanced with weights and pulleys. Further, as another means of warming and changing the air in rooms, I would place a register in the ceiling of every principal room. These articles are comparatively at present inexpensive, and are of the utmost utility in summer and winter.

I have thus far spoken of the conveniences of the house in its parts, in a manner which is only suggestive. Nothing has been said as to its architectural display, or the style of finish to be employed. Sufficient has been hinted at to indicate that its parts should be in perfect keeping with modern taste and refinement. As to the site of a farm house, it is of a prime importance that it should be far enough back from the street or public highway so as to give space for an ample lawn, and for the display of ornamental shrubbery, as well as to avoid the dust in summer.

The accompanying plans embody the ideas here suggested, and are sufficiently plain to be understood as to arrangement of all the rooms. They are drawn for use with a south and west frontage. The building is intended to be two stories high, except the kitchen, and that part including pantry and portion of bathroom which is to be 1½ stories high, so as to give good chambers over kitchen for winter sleeping rooms. The hallway in chamber is to be lighted by oval windows by the side of staircase, and by a sash door in the entry below. It is designed to have cistern outside of the building, with branch pipe leading to the pump in bathroom and kitchen sink, but if it is desired, the cistern can be placed under the pantry, and if the soil is a compact clay, it is all-sufficient for a circular cistern of 7 or 8 feet in diameter, with brick arch resting upon a good shoulder. Of course it should be carried deep enough to let this construction below the frost line. I know of cisterns constructed in this manner which were put in 30 years ago, and are just as perfect to day as when built. The house plan here shown is not only compact, but is adapted to a building, the roof of which should be constructed with four gables of common pitch, or a mansard or hip roof with bracket corners can be used. It represents a house now in progress of erection by the writer. If there is too much bay-window in the estimation of any one who desires to employ it, the two-story bay in the south end for parlor and parlor chambers can be dispensed with, and ordinary windows substituted.

It's easy enough to get two points into line with each other, but to get three—that's what sticks us.

A Visit to Pisa.

We have at different times published letters from our correspondent H. M. Griffiths, carpenter, United States Navy ship Lancaster, of the European Squadron. We have received a communication from him mailed at Massina, Sicily, in which he gives some account of a visit to Pisa, which we think will be of interest to our readers. He writes as follows:

While visiting Leghorn, Italy, last April we spent a few hours at Pisa. A description of this place may perhaps not be without interest to the readers of *Carpentry and Building*. After a ride of some 20 minutes by rail we enter the town on the south side, and on the left bank of the river Arno (which is crossed by arched bridges), and proceed to examine the few scanty relics remaining of one of the greatest commercial towns on the Mediterranean in the eleventh century. In the thirteenth century it was also important as the cradle of sculpture. The Cathedral was erected after the great naval victory of the Pisans, near Palermo (1063), by Busketus and Ramaldus in the Tuscan style, and consecrated in 1118, as a basilica with nave and double aisles, and transept flanked with aisles 312 feet in length by 106 in width in the interior, and covered with an elliptical dome over the center. This well preserved and finely constructed edifice is entirely of white marble with black and colored ornamentation. The façade in the lower story is adorned with columns and arches attached to the wall, and in the upper part with four open galleries gradually diminishing in length. The choir is also imposing. The ancient bronze gates were replaced by the present doors in 1602. These are a work of art well worthy of the sculptor. The only one of the old doors now existing is the Crociera-di-Ranieri in the south aisle, by Bonannus, representing 24 scriptural scenes.

The interior, usually entered by the last-mentioned door on the east side, is borne by 68 ancient Roman and Greek columns captured by the Pisans in war. The capitals are now covered with stucco. The nave has a flat ceiling richly gilded, the aisles being vaulted. In 1596 the dome and church, with the exception of the choir, were seriously injured by fire, but were subsequently restored, and this is very perceptible. The swaying of the bronze lamp which hangs in the nave is said to have suggested to Galileo the idea of the pendulum. The choir contains pews finely carved with landscapes, animals, &c. The floor is of tiles with many designs and colors.

With this short and somewhat disjointed description, we now proceed to the Baptistery, which is separate and distinct, being situated about 300 yards distant from the cathedral. From the inscriptions, we find that it was begun in 1153, by Diatisalvi, and was not completed until 1278, and with Gothic additions of the fourteenth century, which are of marble. It is a beautiful circular structure, 100 feet in diameter, surrounded by half columns below and a gallery of smaller detached columns above. It is covered with a conical dome 190 feet high. This was restored as late as 1856. It has four entrances. Those at the north and east are sculptures in marble of the twelfth century. One of the remarkable things about this building is the fine echo which lasts for seconds, and I think our American architects would do well to study the acoustics of this ancient structure.

We next visited the Campanil or Clock Tower, usually known as the Leaning Tower of Pisa. It was begun by the architect Bonannus of Pisa, in 1174, and completed in 1350 by others. It is eight stories high, and is surrounded with columns and six colonnades. It has an incline of 13 feet in a perpendicular hight of 179 feet. The question whether this was done intentionally or was caused by the settling of the foundation, has been frequently discussed. At all events, it is a wonder well worth a visit. Galileo availed himself of the oblique position of the tower in making his experiments regarding the laws of gravitation. There are 294 steps on a circular staircase from base to top, inclosed by two walls, with apertures leading to each balcony. The tower contains seven bells, the heaviest of which weighs six tons, and hangs on the side opposite the overhanging wall of the tower. The view from the upper balcony, embracing the tower and environs, the sea to the west, and the mountains to the northeast, is more than beautiful.

American versus English Skill.

A correspondent of *Chambers's Journal* writes as follows:

When I was in Cincinnati, bricklayers were earning £1 a day, and the same rate prevails in many other cities. But the work was far more exhausting than in England. Here a bricklayer is reckoned a good hand if he sets 900 bricks per day; 1000 is high-water mark. In the United States 1500 is the average, and some smart fellows have set 2000 per day. Now, at the outset, most Englishman find this rapid style simply destructive. And there is no doubt that it taxes the energy of the strong and clever. Yet such is the custom of the trade. For the weak and incompetent it means exclusion from first-class employment and banishment to places remote from thriving cities, where speed is slower, competition feebler and wages low. Although the standard is so much higher than in England, our immigrants, after a period of probation and "hardening," are found equal to all comers. An instance of this will be apropos: A German master-builder was erecting a block of houses, and his employees were exclusively Germans. Four young English bricklayers applied for work. They were newly arrived, and met with several refusals. At length, two were taken on trial. By the end of the week the four were engaged; by the end of a fortnight all the Germans were dismissed and the Englishmen carried the building to its completion. Their power to work, quickness and steadiness gave them a marked advantage over the Germans; but their determination not to be "licked" was the real cause of their triumph. That British characteristic tells prodigiously in favor of the Anglo-American, and makes him *facile princeps* amid natives and strangers. These young bricklayers told me that they never worked so hard in their lives before, and were glad that a crucial test had revealed to them "what they could do" After this breaking-in they were equal to the highest standard of American labor. One of them soon became an employer, and was making sure tracks for fortune when I last saw him. What I have said of the building trade applies to all others. Indeed, the higher dexterity, taste and skill a business requires, the more does the American workman respond to the demand. The plasticity of type to which I have referred is nowhere seen so plainly as in the domain of the useful arts. Germans and Frenchmen have given a finish to Americau manufactures that is wanting in our own. Besides, there is a native neatness, the result of a high ideal of excellence. This matter deserves the serious attention of British manufacturers, who are losing many markets simply from the clumsiness of their goods. There is rising in the United States a race of artists, designers and artificers who promise to surpass those of all other nations. The fervor of the climate develops the æsthetic side of man; the clash of millions of eager, inventive minds is producing a standard of excellence that is both novel and exalted; the possibilities of wealth are vastly beyond those of any European state, and the love of the elegant and the beautiful pervades all classes. The inevitable sequence of these conditions must be widespread, all-dominating art. It is seen in the gorgeous public buildings, in the exquisite villas, in the light, yet strong, furniture, in the beautiful appointments of drawing-rooms and table equipages; while every American lady is living evidence of an innate taste in dress that makes the English suffer by contrast. Into every avenue of life this characteristic of taste goes, modifying manners and behavior as much as architecture, furniture, dress, ornaments and tools.

The hotel recently erected by Mr. John McDonough, at Fargo, Dakota Territory, is considered one of the handsomest buildings in that city. It has been put up at a cost of about $12,000.

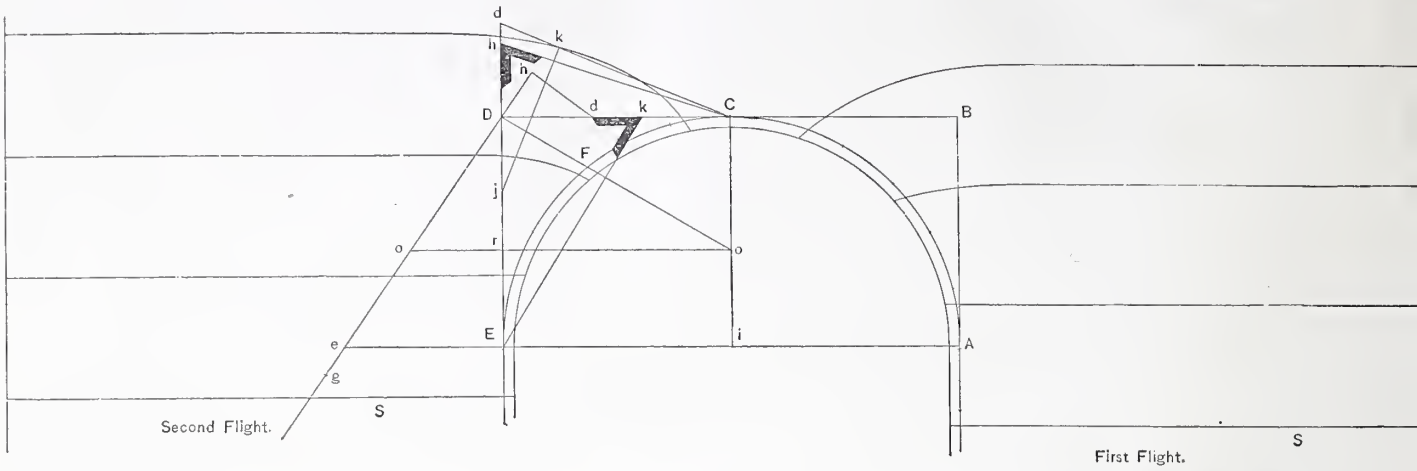
Practical Stairbuilding.—XXIII.

DIFFERENT TREATMENT OF FLIGHTS OF STAIRS.

The first figure of the accompanying engravings shows how a flight of stairs may be built with a large cylinder and yet have the rail continue at the same pitch all the way up. In Fig. 5 we show a second plan which occupies the same space as the first and in many respects is like it. The difference is that in this case there is only one baluster to a step and the winders extend all the way up. The latter is commonly called half-circle stairs.

Referring to Fig. 1, we will first describe the method of constructing this plan. First draw the cylinder as large as may be desired, also the center line of the rail A C E. Draw the face lines of the wall strings at the sides. Begin at C and space off the balusters each way the same distance apart as they are upon the straight steps. Draw the straight riser lines S and S. From these measure off toward the platform the ordinary width of the treads, and draw the other riser lines as shown in the engraving, curving them toward the cylinder when necessary, and thus making the fronts at the cylinder very nearly alike.

To construct the rail, draw the tangent lines A B, B C, C D and D E, and also draw A E and I C. On the side D E draw the triangle D *e* E, making the rake of the tangent D *e* the same as the regular pitch of the stairs. Subtract twice E *e* from the whole hight required in passing from A around to E. Produce E D in the direction of *d* making D *d* equal to half the remainder. Draw C *d*, the elevated tangent, over C D. Produce *e* D to *h*. On the line D C take D *d* equal to the altitude D *d* and from *d* draw *d h* at right angles with *e h*. Take D *h* equal to *d h* and draw the bevel line *h* C. Take *d j* equal to *c* E and from *j* draw *j k* at right angles with *d c*. Take D *k* equal to *j k* and draw the bevel line *k* E. Draw O *r* o parallel with E *e*, so as to make *o r* equal to D *d*. Draw O D.



Practical Stairbuilding.—Fig. 1.—Plan Showing how a Flight of Stairs may be Built with a Large Cylinder and with Rail at One Pitch from Top to Bottom.

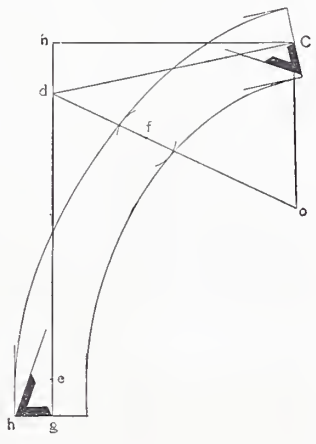


Fig. 2.—Wreath-Piece Pattern Derived from Preceding Plan.

To draw the face pattern for the wreath-piece, proceed as shown in Fig. 2. Draw *e d h* equal to *e* D *h* of Fig. 1. Add *e g* for straight wood. At right angles with *g h* draw *h* C equal to the bevel line *h* C. Draw C *d*. Parallel with *h g* draw C o equal to D *o*. Draw *o d*. Make *d f* equal to D F of Fig. 1. At C and *g* make the pattern about one-fourth wider than the rail and at *f* only a little wider than the rail. At each end draw short lines and edges of the pattern parallel with the tangents. With these serving as guides at each end and touching short arc lines struck from *f* as center, draw the inside and outside curves of the pattern ; *h* is the plumb bevel at *g*, while the bevel indicated in the engraving just below C is the plumb bevel at the opposite end. This pattern also answers for the other wreath-piece. Both pieces join the straight rail without any ramp.

Referring now to the half-circle stairs shown in Fig. 5, the first thing to be done is to draw the cylinder, after which the center line of the rail and then the face line of the wall string. Begin at C and space off the balusters, making the baluster *j* about one half the width of a tread from the line G K. Draw the riser lines S and S parallel with the landing riser, curving the end next to the cylinder to suit the baluster *j*. Make the first winders with one baluster as wide as possible at the front ends, for the purpose of helping the easement on the under edge of the string. Make the first straight steps next to the winder considerably wider than usual at the wall string, as shown in the engraving. Make all the winders with one baluster of the same width at the wall string. The stretch-out of the half circle may be found by multiplying the radius by 3.1416.

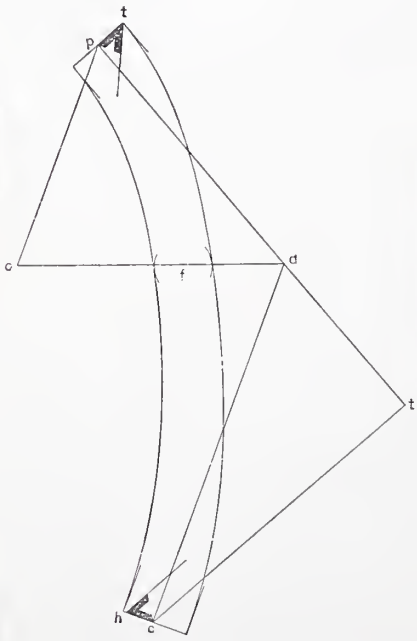


Fig. 3.—Pattern of the Middle Wreath-Piece of the Railing shown in Fig. 5.

To construct the rail, proceed as follows : First draw the tangents A B, B C, C D, D E, E G and G K, also A E and K C. Transfer the short balusters from the curve line E K to the tangent E G by lines drawn parallel with K G. On the line E A take E S, equal to half the riser, and from S start an elevation of the short balusters which are found on the line E G. Produce K G to *g*, making *n g* equal to half a riser. From *g* draw the elevated tangent *g p* through the long baluster near E. Produce the line D B to *l* and *e*. With B as a center, draw the arc lines A *a* and L *l*. With D as center, draw the arc E *e*. Through B draw the rake line *u* B *l*, representing the pitch of the straight rail on the stairs below. From *l* on the line *c l* draw the perpendicular *l l*, meeting the pitch line B *l* at *l*. Through *l* draw the level line *l m*. Through *e* draw the perpendicular line *m p*. On this line make the hight *m s* equal to 11 risers, the number which is found in passing from L around to Z. Make *s p* equal to *s p*,

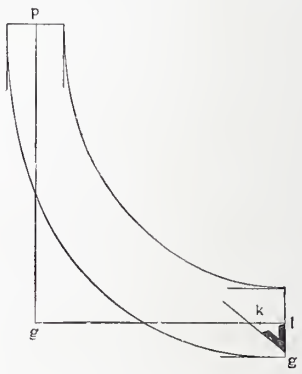


Fig. 4.—Pattern of the Upper Wreath-Piece of the Railing shown in Fig. 5.

and from *p* draw the rake line *p d t* on the same pitch as *g p*. Draw the perpendicular D *d d*. Through *d*, the point where the pitch line *p d* meets the perpendicular, draw the pitch line *h d* B *v*. Draw the perpendicular *a a* and the level line *a b*. The triangle *a* B *b* shows the elevation for the tangent *a* B over A B. Draw the perpendicular o *g* O so that *g* o shall be equal to the hight *a* B. Draw the measuring line O B. From *p* draw *p d* at right angles with *d d*. Take *d y* equal to *d d*, and from Y draw *y o* at right angles with *d y*. Draw the perpendicular *o r* O. From O draw the measuring line O D. Transfer the short balusters from the curve line C E to the tangents C D and D E respectively by lines drawn parallel with O D. Thence transfer theso on the tangent D E to the line D *e* by the dotted arcs. Transfer the short balusters from the curve line A C to the tangents A B and R C respectively by lines drawn parallel with O B. Thence transfer thoso on the tangent A B to the line B *l* by dotted arcs. Beginning at *l*, draw the elevation of the short balusters from L to Z,

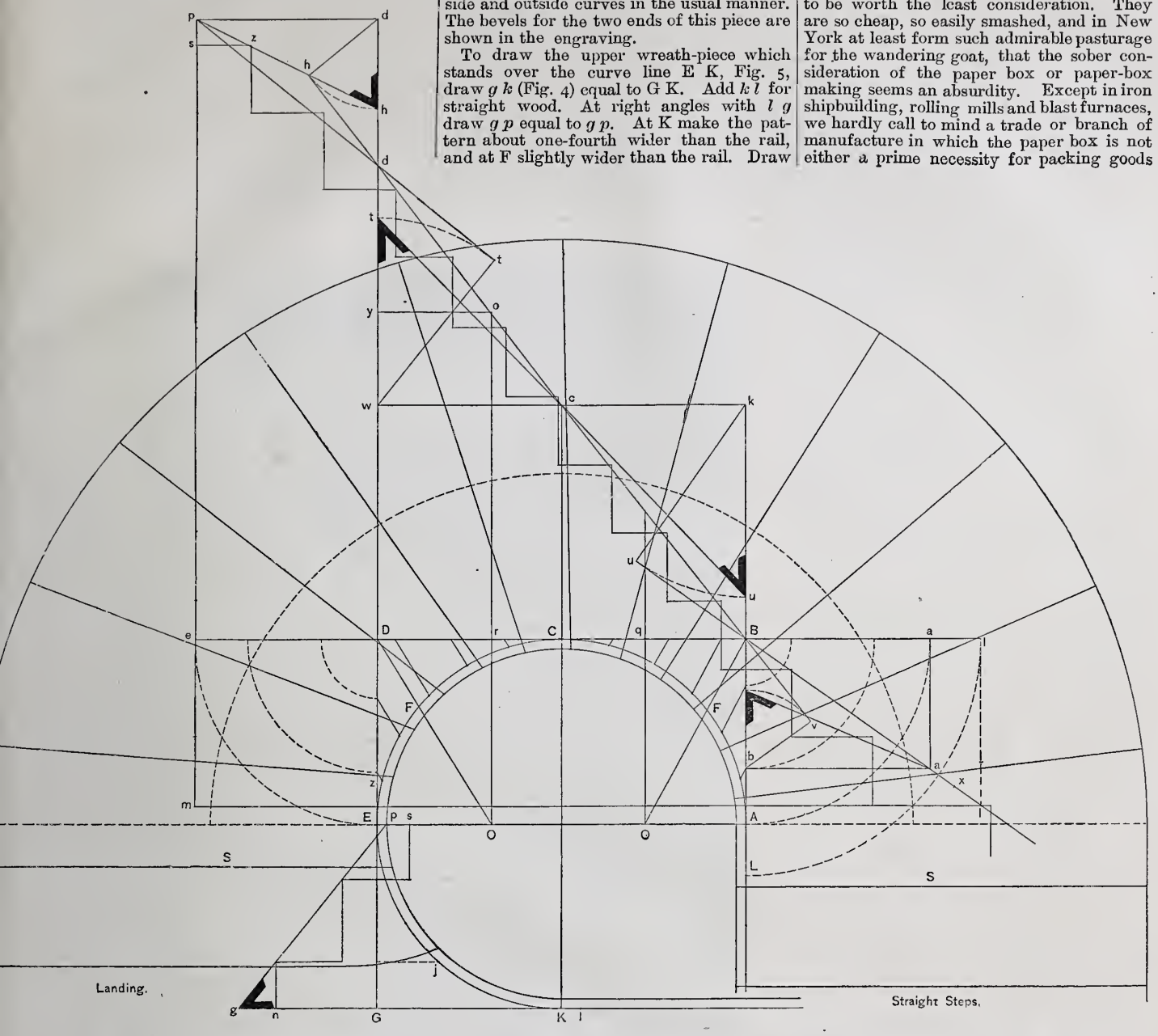
as shown in the engraving. In the front of *l* the real riser line is drawn for convenience in taking the length of the straight rail.

p o equal to *d* o. Draw o *d*. Take *d f* equal to D F of the general plan. At *c* and *p* make the pattern about one-fourth wider than the rail, and at *f* slightly wider. Draw the inside and outside curves in the usual manner. The bevels for the two ends of this piece are shown in the engraving.

To draw the upper wreath-piece which stands over the curve line E K, Fig. 5, draw *g k* (Fig. 4) equal to G K. Add *k l* for straight wood. At right angles with *l g* draw *g p* equal to *g p*. At K make the pattern about one-fourth wider than the rail, and at F slightly wider than the rail. Draw

The Paper Box.

Of all insignificant things with which the public come in contact, the paper box seems to be worth the least consideration. They are so cheap, so easily smashed, and in New York at least form such admirable pasturage for the wandering goat, that the sober consideration of the paper box or paper-box making seems an absurdity. Except in iron shipbuilding, rolling mills and blast furnaces, we hardly call to mind a trade or branch of manufacture in which the paper box is not either a prime necessity for packing goods



Practical Stairbuilding.—Fig. 5.—Half-Circle Stairs, Occupying the Same Space as the Arrangement Shown in Fig. 1, Differing from it in Having Winders Throughout.

To get the bevels for the lower wreath-piece from *b* draw *b v* at right angles with the pitch line *p v*. Draw the arc *v v*. Draw the bevel line *v a*. Draw the perpendiculars B *k* and C *c*. Through *c* draw the level line *k c w*. Draw *k u* at right angles with *l u*. Draw the arc *u u*. Draw the bevel line *u c*. To draw the face pattern for this wreath we proceed as shown in Fig. 6. Draw *u b* A equal to *u* B *a* of Fig. 5. Add A *x* for straight wood at the lower end. At right angles with *x u* draw *u c* equal to the bevel line *u c*. Draw *c b*. Parallel with this line draw A o equal to B o. Draw o *b*. Take *b f* equal to B F of Fig. 5. At A and *c* make the pattern about one-fourth wider than the rail, and at *f* slightly wider than the rail. Draw the inside and outside curve lines in the usual manner. In the engraving the bevels for the joints at the two ends are indicated.

To get the bevels for the second wreath-piece draw the line *w t*, Fig. 5, at right angles with the pitch line *p d t*. Draw the arc *t t*. Draw the bevel line *t c*. Draw the line *b h* at right angles with the pitch line *c d h*. Draw the arc *h h*. Draw the bevel line *h p*. To draw the face pattern for the second wreath-piece proceed as shown in Fig. 3. Draw *p d t* equal to *p d t* of Fig. 5. At right angles with *p t* draw *t c* equal to the bevel line *t c*. Draw *c d*. Parallel with *d c* draw

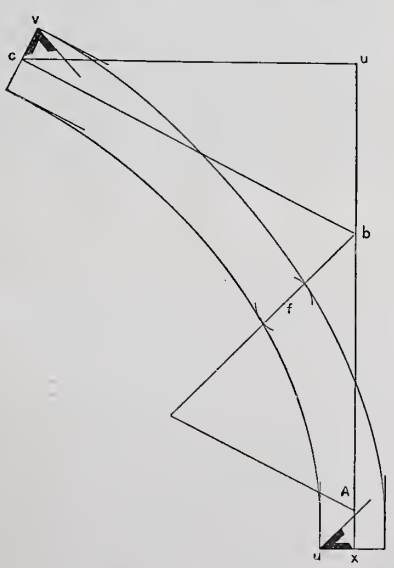


Fig. 6.—Pattern for the Lower Wreath-Piece.

the curve boundary lines in the usual manner. In the engraving *g* is the plumb bevel at *l*. At *p* there is no twist.

or essential in some way. America is really the home of paper boxes, and it is more extensively employed here than in any other country. Its value in the hardware trade is astonishing, and yet is appreciated by only a few. Its very general use has done away with the necessity for tying and untying parcels when showing goods. In countries where the old-fashioned method of doing up everything in hardware paper still prevails, the work of the clerks is increased to an enormous degree, and the easy entrance of American goods into English colonial markets, is due in no small degree to the fact that they are packed in boxes in such a way that only a second of time is needed to open them, display goods, and close them up when it becomes necessary.

To make a paper box calls for an amount of machinery quite surprising to one who has never given the subject attention, or who has only seen them produced with the paste brush and paper cutter. Although in many establishments machinery reduces the labor to a minimum, it still seems as though there were a great variety of boxes which might be made at a single operation from paper pulp more cheaply than by any known methods of cutting up sheets of paste or cardboard. The weak point of box making at the present time is the round box. Square boxes have a secure bottom and top, but the

round box is a delusion and a snare in these respects, for the least pressure smashes in the top, and splits the bottom away from the sides. It would seem that a machiue which could handle paper pulp so as to give a box in which sides and bottom are continuous, would be an immense advantage. Another application of paper not unlike box-making is the manufacture of paper tubes for protecting drawings and paper from injury in the mail. Even the best of these, however, labor uuder the disadvautage of being made from a sheet of paper, and when not carefully pasted, lack the strength which they would have if made directly from pulp of the required thickness of sheets thoroughly coated with paste. The question of course arises, why theso could not be made from pulp, aud save the waste iu handliug and drying, which is of course inseparable from the use of sheets of paper. This is a matter of importance, and we commend it to the notice of manufacturers.

An Ancient Casting.

We present herewith a striking illustration of a very remarkable iron casting, concerning which *The Metal Worker* has the following:

We supposed in the beginning that it was the end of a very old box stove, but subsequeut consideration leads us to believe that it is the fire-back or center-piece of a cast-iron fire-place lining. It was taken from the chimney of an old stone house iu Kingston, N. Y., where it had been for an indefinite period, and after much cleaning, to remove the accumulated rust of centuries, the orginal design was developed in a state of preservation so excellent that we are able to make the very striking picture to which the attention of the reader is called. The plate was probably cast in Holland, as the design gives uumistakable evidence of Dutch art. The date, 1569, is perfectly legible, and may be assumed to show the year in which the pattern was made, although it is possible the casting was subsequent thereto. The visible iuscription is as follows:

IACOBS BRUN CHRIST
VOM FROLIN VON SAMARIA
IOH 4.

Translated into modern English, this means that the ceutral figure in the picture is Jacob's well; that the figure on the right of tho pauel is Christ, and that the scene relates to the interview of Christ with the woman of Samaria, as recounted in John, 4th chapter.

A strange mixture of costumes was characteristic of all historical painting and decoration of that age, aud the old plate is an interesting example of it. While the ancieut costume is tolerably well represented upon Christ and his three disciples, the woman of Samaria is shown coming to the well with a Flemish ewer, and dressed in a stylish costume of the Sixteenth Century. She has on a long, straight corset, and a ruff not unlike those represented about the neck of Queen Elizabeth. The head is covered with a close-fitting cap, and her tight sleeves are puffed at the top just over the shouldor. Around her waist is a sash of some sort, tied with a bow over the hip. The skirt is of a pattern decidedly fashionable at the preseut time. Altogether, the lady's dress would not be remarkably out of stylo seen on Broadway at the present day. Realism was beginning to find its way into art at that day, for the dress of the disciples and Christ is precisely the same as that which we see represented in the pictures at the present day. It is, in fact, the flowing costume of the East. In the distance are seen two trees and the battlements of Samaria, beyond which the houses appear. These, however, are very much like those of an ordinary German city of that day. One of the buildings seems to combine in its features both bell tower and city gate, and from beneath the large arched entrance several persons are represented as issuing. The well itself has an ornamental curb, and is furnished with a pair of buckets suspended by a chain over a 12-spoked wheel. One is represented at the top of the well, the other apparently being at the bottom. After the old German fashion, an arched roof of shingles or slates extends from one of the ornamental posts which support the wheel to the other, covering it in. All the buildings are represented with slated, tiled or shingled roofs, some of them being curved, but most of them high peaked. On the roof of the well the shingles have rounded ends, and some on tho other buildings seem to have been oruamentally cut.

Below the maiu panel is a narrow one extending the whole width of the casting, aud containing two figures of angels having flowing drapery. These aro disposed upon each side of the center. In the center we have what may be a large letter A, and on the left an H and ou the right an M. This may be the monogram referring to Christ, which is made somewhat probable from the fact that at tho top of the A is a mallet, and on the other a pair of piucers. A vertical line through the center of the A might possibly be taken for a nail, thus making direct allusion to the cross, theso being sacred emblems. The casting at this point is so indistinct and badly corroded that it is hardly possible to be definite. The A, without any great stretch of the imaginatiou, may be a carpenter's or mason's plumb, and the hammer and pincers be the emblems of the trade rather than of the crucifixion. These letters or symbols are arranged thus HAM. If this is the carpenter's plumb and line, the vertical line in the A is the plumb-bob hanging from the apex. This would be a direct allusion to the trade instead of the crucifixion of the Saviour. At the upper left-hand corner of the large panel is the letter B sandwiched in betweeu two of the spires of the town. This is very plain in its form, and may be the initial of the place where the plate was cast. The monogram A and F combined is found just over the head of one of the apostles in a blank space on what may be a part of the city wall. This is very likely the monogram of the designer.

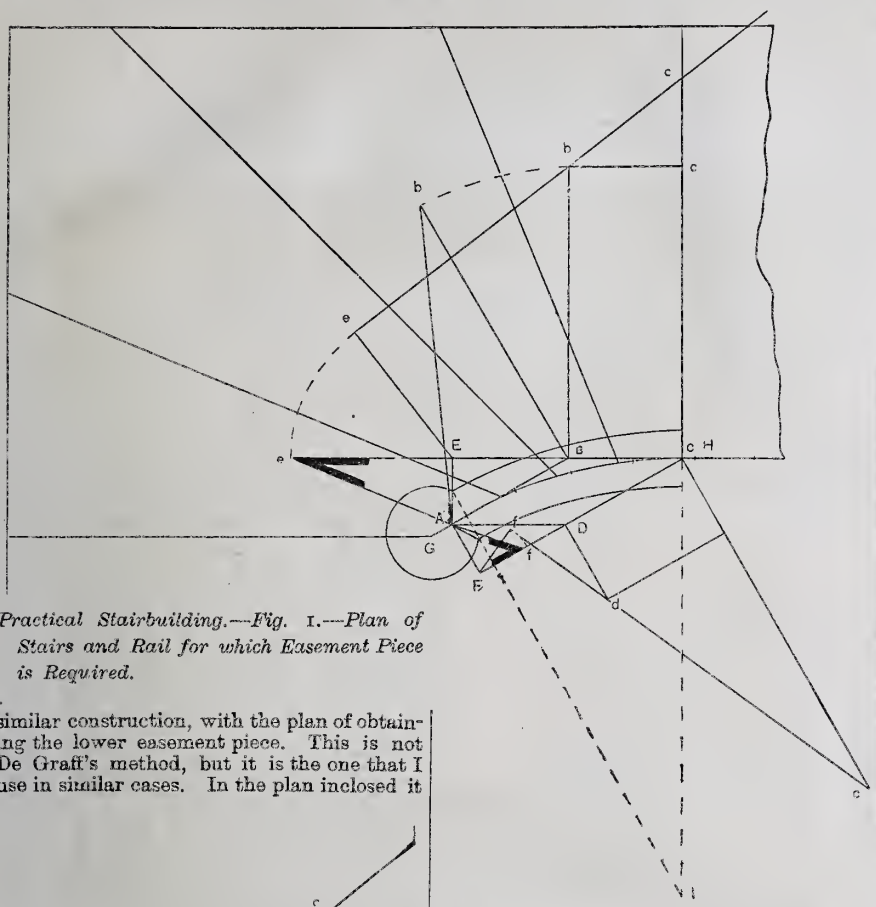
The plate is about 17½ by 26 over all, and weighs from 85 to 90 pounds. It is from 1¼ to 1½ inches thick, and was evidently cast in an open sand mold. Many parts of the plate, especially the moldings and the lower panel, have suffered much from corrosion. Where the molding separating the two panels joins the molding at the side is evidently a considerable flaw in the original casting. The faces of Christ and the three apostles have suffered comparatively little, and it is easy to see that they were executed with a good deal of artistic knowledge, the expression being good and the grouping vastly better than could be expected in a work otherwise so crude. Tho relief in some places is considerable, amounting to fully ¼ inch. The moldings are even deeper, being about 7-16ths. Probably when the plate was cast they were at least ½ inch above the background of the panel. Taken altogether, the panel is one of the most interesting things in its line which we have had occasion to notice. A copy of this interesting plate, remarkable for its fidelity aud for the manner in which the appearance of age is preserved, now hangs in tho office of the editor of *The Metal Worker*, where it will be shown with pleasure to any one who may care to examine it, either as a curiosity or as an object of rare archæological interest.

A Fire-Back of the Sixteenth Century.

CORRESPONDENCE.

Practical Stairbuilding.

From F. S. W., *Cleveland, Ohio.*—I promised some short time ago to furnish for *Carpentry and Building* a plan of stairs similar to the one proposed by S. N. W., in the March number of 1881. I now inclose a sketch showing the center line of rail of



Practical Stairbuilding.—Fig. 1.—*Plan of Stairs and Rail for which Easement Piece is Required.*

similar construction, with the plan of obtaining the lower easement piece. This is not De Graff's method, but it is the one that I use in similar cases. In the plan inclosed it

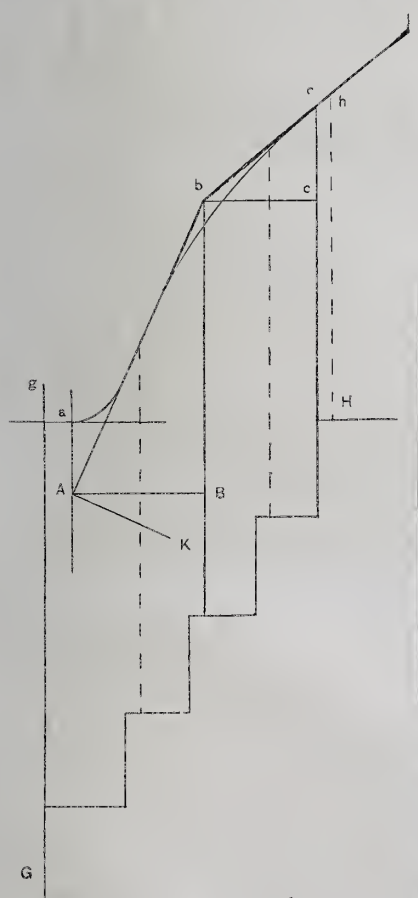


Fig. 2.—*Elevation of Stairs Shown in Fig.* 1.

is supposed that the winders are followed by a straight flight above them, with 8-inch risers and 10-inch treads on the straight part. It is required to find the plan of an easement-piece of rail, covering the space from A to C, joining the straight rake rail above, and meeting the newel cap on a level at the point of miter. From I, the center from which the curve of string is drawn, draw the radius line across the rail where it meets the cap. Squaring from this radius line draw the tangent A B, meeting the center line of straight rail produced at B. At the left of the plan draw an elevation, making the horizontal distance *c b* equal to C B of the plan, and B A equal to the corresponding ground tangent B A. Add the distance *a g* equal to A G of the plan. By this we have the entire distance occupied by the winding steps as they appear, taken on the tangent lines. Drawing a floor line we next construct an elevation plan of the treads and risers covering the horizontal distance, as above stated. Let the vertical line G *g* represent the center line of the newel post. Let a horizontal through *a* be the hight at the center of the cap. Let H *h* represent the hight of a short baluster on the straight flight, measuring from the step up to the center of the rail. Draw the perpendicular line through *c c* and the line through B *b*, so as to make the distance between them equal to C B of the ground plan. Through *h* draw the rake line of straight rail to *b*. Draw the plumb line through *a* A, making the distance from *a* to *g* represent the distance of the point of miter from the center of cap.

We will make, first, a regular wreath-piece, covering the ground plan, leaving both its tangents on a pitch. By altering its lower end we will get an easement, which will come on a line with the cap, as shown by the curved center line in the figure. It is evident, in order to do this, that we must drop the lower end of the twist somewhat below the point of the miter line in order to gain room for the curve. Accordingly, we draw the bottom pitch line *b* A, keeping far enough away from *a* to admit of a short easement. Next, draw the horizontal lines A B and *b c*. We have thus formed elevations to put over the ground tangent lines A B and B C. Upon the ground plan, we therefore draw the corresponding elevations. To produce the face pattern of the rail with bevels we proceed as follows: Produce the line C B somewhat to the left as to *e*. Draw A E at right angles with C E. Continue the rake line *c b* to *e* and draw *e* E at right angles with *c e*. On the line C E *e* make E *e* equal to E *e* of the elevation, and draw *e* A. The angle E *e* A will be the plumb bevel of the top end of the twist. Complete the parallelogram A D C B. On the side D C make the elevation D *d e* C, the hight C *c* being equal to C *c* of the other elevation. The hight D *d* will be equal to *c c*. Produce C D to F and draw F A square to C F. Produce *c d* to *f* and draw *f* F square to *c f*. On the line F C make F *f* equal to F *f* and draw *f* A. Then the angle F *f* A will be the plumb bevel of the lower end of the wreath-piece.

To draw the face pattern we proceed as follows: In Fig. 3 make the line *c b e* equal to *c b e* of the elevation and its parts respectively. Draw *e* A at right angles with *c c* and of the same length as the bevel *e* A. Join *b* and A. Then A *b* and *b c* are the tangent lines of the face pattern. A little straight wood may be added at the top end of the pattern, as shown at the right of the point *c*. Draw the butt joints at either end at right angles with the tangents. Make the pattern a little wider than the width of the rail at *e*. At A leave the top side of the pattern 2 inches wider to allow for the easement. Draw the curves by bending a strip of lath, keeping it parallel with the tangent lines at each end. Place the plumb bevels on the pattern, both of them the same way, as both are to apply from the same side upon the ends. Cut the plank square through by the pattern. Use a plank somewhat thicker than the width of the rail, in order to allow for the easement curve upon the bottom end of the twist. After making the butt joints, square down the tangents upon them, and take the center of rail as near the bottom of the plank as the upper end of twist will admit. Through these centers draw the plumb bevels. Place the square pattern upon this upper end in the usual manner. At the lower end draw a horizontal line through the center point as before fixed, and from this line cut a new surface plumb, using the angle *k* A *a* of Fig. 2. From the first center point draw a vertical line upon this newly-cut surface, and with the hight A *a* of Fig. 2 establish a new center point. On this center point place the square pattern and mark around it. Cut the twist and easement by the eye, starting at each end, square with the joint.

Paint for Tin Roofs.

From D. M. McC., *Florence, Pa.*—Pleaso let me know, through the correspondence department of *Carpentry and Building*, what is the best paint for tin roofs?

Answer.—This question has been replied to at different times in *Carpentry and Building*, but as it is one of considerable practical

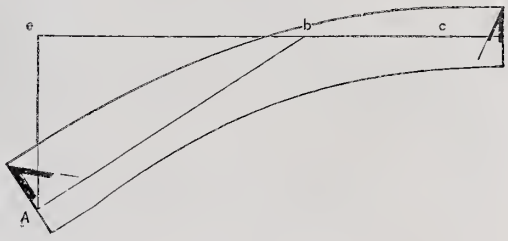


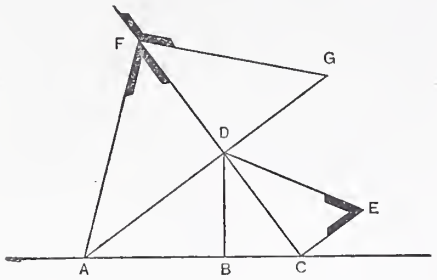
Fig. 3.—*Drawing the Face Pattern.*

interest, and is continually arising in the minds of those who have charge of building operations, it will bear repeated attention. From long experience, and from a theoretical consideration of the subject, we believe those paints are best for roofs which in their composition contain the largest quantity of oil in proportion to the body of the paint. We think those paints are the least serviceable for tin roofs in which the conditions are the opposite of those above stated. For this reason we are not in favor of the so-called ironclad or mineral paints, which are in extensive use at the present time. The principal quality which recommends them for use is cheapness, and this is based upon the fact that the least possible amount of oil is required for a given amount of body. We think that the oil is the real protection to the metal surface, and that it should be re-

garded as the essential quality of the paint, the pigment being used simply as a body. Vermilion, ocher, and some other materials of a similar character are generally found satisfactory for this purpose.

Hopper Bevels.

From J. W. L., Jr., *Norwich, Conn.*—To obtain the bevels of a hopper, the rise to the foot of the sides being given, first ascertain the hypothenuse from 12, taken on the



Hopper Bevels.—Fig. 1.—*Method of Determining the Bevels of a Hopper by Geometrical Construction.*

blade of the square, to the rise to the foot, taken on the tongue. Divide the square of 12 by the rise to the foot. Apply the square to a straight-edge, taking the hypothenuse on the blade and 12 on the tongue. This will denote the surface bevel. Again, apply the square to the straight-edge, taking the hypothenuse on the blade and the rise to the foot on the tougue. This will denote the bevel of the miter-joint, so called. For a butt joint, take on the blade the quotient arising from the division of the square of 12 by the rise to the foot, and on the tongue take the hypothenuse. Then the blade will denote the bevel required.

A second method is as follows: Apply the square to a straight-edge, taking 12 on the blade, the rise to the foot on the tongue, and mark by the blade to obtain A D of Fig. 1, which represents the inclination of the sides. At random make B D perpendicular to A B C, which represents the straight-edge, taking A D on the blade and A B on the tongue. This will give the surface bevel. Again, apply the square, taking C D on the blade and B C on the tongue, which will denote the bevel for the miter joints. For butt joints apply A B taken on the blade and C D taken on the tongue. The blade will denote the bevel required. The same results

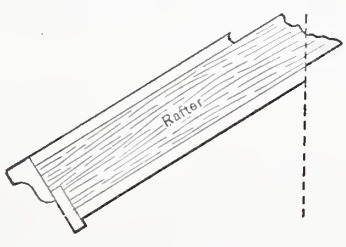


Fig. 2.—*The Same Principles Applied to Cornices and Roofs.*

may be obtained by geometrical construction, as follows: Referring to Fig. 1, make D F equal to A B and draw A F, make D G equal to C D and draw F G, make C E perpendicular to C D and equal to B C and draw D E. The designated acute angles at F will be the angle of the surface bevel. The designated obtuse angle at F will be the bevel for the butt joint. The angle at E is the bevel for the miter joint.

The foregoing may be applied to roofs of one pitch over rectangular bases. Fig. 2 represents a section of cornice. That which relates to the surface bevel is applicable to the surface bevel of the boarding, the outward bevel of purlins which come in contact with each other or with hip rafters, the surface bevel of the planceer in a cornice similar to the diagram, and the edge bevel of a fascia. That concerning miter joints is applicable to the edge bevel of the boarding, the inward or down bevel of purlins, and the surface bevel of the fascia. Applying the square to a straight-edge, according to the directions given in the first and second methods above presented for obtaining the surface bevel, and marking by the blade, we obtain the edge bevel of jack rafters. In Fig. 1, F A D denotes the edge bevel of jack rafters. In order to properly get the crown molding for a cornice similar to the drawing, lay off on the edges of a miter-box the surface bevel of the board, and on the sides the edge bevel.

To obtain the bevels for a hopper having two pitches, the rise to the foot of the sides being given, proceed as follows: First find the bevels of the opposite sides having the lesser rise to the foot. Apply the square to a straight-edge, taking 12 on the blade and the lesser rise to the foot on the tongue. Mark by the blade for A B of Fig. 3. Make B C perpendicular to A C B and equal to the greater rise to the foot. Draw B D perpendicular to A B. Apply the square to the straight-edge which is here represented by A C D. Taking A C on the blade and 12 on the tongue, mark by the blade for C E. Make D E perpendicular to A C D. Apply the square to the straight-edge, taking A B on the blade and 12 on the tongue, which will denote the surface bevel. Apply the square, taking B D on the blade and D E on the tongue, which will denote the bevel for the miter joints. For butt joints, take B D on the blade and 12 on the tongue, which will denote the bevel required.

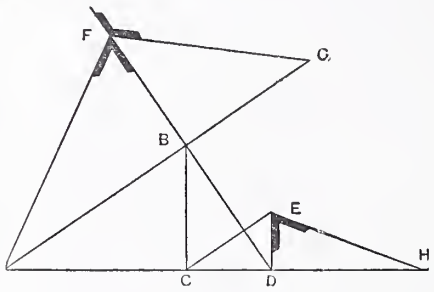
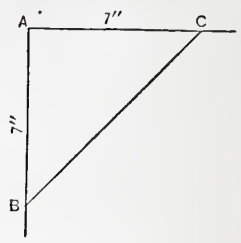


Fig. 3.—*Method of Obtaining the Bevels for a Hopper Having two Pitches, by Geometrical Construction.*

The same results may be reached by geometrical construction as follows: Still referring to Fig. 3, make B P equal to 12 inches. Draw A F. Make B G equal to B D, and draw F G. Make D H equal to B D, and draw E H. Then the designated acute angle at F is the angle of the surface bevel, and the designated obtuse angle at F the bevel for the butt joints. The angle E is the bevel for the miter joints. To find the bevels of the opposite sides having the greater rise to the foot, proceed in the same manner, being careful to supersede lesser rise for greater rise, and greater rise for lesser rise, in the directions here given. That which relates to the surface bevel in Fig. 3 is applicable to the surface bevel of the boarding and the outward bevel of purlins in contact with each other or with hip rafters. That which relates to miter joints is applicable to the edge bevel of the boarding and the inward or down bevel of purlins. Applying the square according to the rule for obtaining the surface bevel in the first method, and marking by the blade, we obtain the edge bevel of jack rafters. In Fig. 3 the angle F. A. B. denotes the edge bevel of jack rafters. That which relates to butt joints is applicable to the edge bevel of the boarding of one part when it is made to lap on that of the other. To obtain the down and lower bevel of hip rafters, ascertain the hypothenuse from A C, taken on the blade, to 12 on the tongue, and then apply the square to a straight-edge, taking the hypothenuse on the blade and B C on the tongue, This will give the down bevel. The blade will denote the lower bevel. The edge bevel of the boarding is of no great consequence, so far as the board is concerned, but when we have to deal with purlins and other parts of a roof which sustain the same relations to it as boarding, it becomes a matter of greater importance. The principles involved in the construction of valley roofs are identical with those relating to high roofs, hence the foregoing is also applicable to valley roofs. "A knowledge of hopper bevels is not all that is necessary to make a number one, bang up, top of the heap, cock of the walk carpenter," quoting from your correspondent, H. McG., nevertheless the principles relating to the construction of hoppers play an important part in carpentry, and constitute a study which is worthy of any man's attention.

Making a Square Stick Octagonal.

From F. A. R., *Kendaia, N. Y.*—I have been looking over some of the back numbers of *Carpentry and Building*, and I notice on page 92 of the volume for 1880 a communication from B. F. S., in which he says to make an octagon from a piece 2 feet square by taking 7 inches from the corners each



Making a Square Stick Octagonal.—Fig. 1. —*A Section Through a Corner of a Stick* 24 *Inches Square.*

way will not do. I differ from this correspondent, for according to the old rule of laying on the square diagonally across the piece, and marking out 7 and 17 inches, it is correct. In this case the square does not require to be put diagonally, by reason of the width of the piece; 7-24th of the side of a square stick gauged from the corners each way will make a perfect octagon.

Note.—This question has been up for discussion in our columns in several different forms. For the benefit of this correspondent and others we reproduce the following from our March issue for 1880, omitting two of the engravings then employed: Fig. 1 shows a section through one corner of a timber; B and C represent the gauge marks on an adjacent face of the timber, and are each 7 inches removed from the corner A. The timber, of course, is to be dressed until the line B C becomes a surface. Now, if the rule were accurate, the diagonal B C in Fig. 1 should measure exactly 10 inches, because the adjacent faces, by the rule, would be laid off by measurement to that dimension, and all the faces of the octagon should be the same dimension. That B C in this case is not exactly 10 inches may be easily proven. Since C A B is a right angle, the length of C B must be equal to the square root of the sum of the squares of B A and A C ($7\times7=49$; $49+49=98$), the square root of which is less than 10, the square of 10 being 100. It follows that a stick of timber reduced to octagon shape by this rule will have four of its sides 10 inches in width and four of its sides a fraction less than 10 inches, equal to the square root of 98. Fig. 2 shows the same thing in a little different shape, by represent-

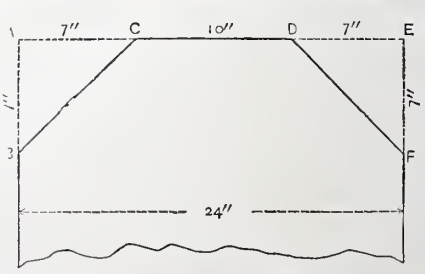


Fig. 2.—*Part Section Through a Stick* 24 *Inches Square after Shaping.*

ing a partial section through a timber 24 inches square. The gauge marks C and D are each 7 inches from the corners A and B; the side C D is 10 inches, but the sides C B and D F are less than 10 inches. As this rule,

like some others in common use, is supposed to be mathematically accurate, we think the diagrams we have introduced will be of interest to our readers.

Measurements of Masonry.

From G. W. P., *Carthage, Illinois.*—I am afraid T. N. F., who inquired about measurements of stonework in the November number of *Carpentry and Building* will get several answers to his question, some of which will not exactly tally. He will find, I think, that there are various rules, agreements or tacit understandings among mechanics in different localities as to how a wall shall be measured, and even as to how many cubic feet shall constitute a perch. It seems strange that this should be so when the text books tell us plainly that 24¾ cubic feet make one perch of stone. I once consulted an attorney in a proposed litigation on this very point. He told me that while I might set up and prove that it required 24¾ cubic feet to make an actual perch of stone, yet if it was proven on the opposite side that an established custom in that neighborhood recognized a different number of feet in a perch, then the law would presume a tacit understanding to that effect, text books to the contrary notwithstanding. Of course ignorance and indifference cause this variation among mechanics, and it is a matter of regret that they, like politicians, should disagree on such palpable points. Within a radius of 20 miles of this place I have found four different perches in use, namely, 16½ feet, 20 feet, 22 feet and 25 feet. In this immediate neighborhood we use the 25-foot perch, as it is approximately correct and is much easier figured. On this basis I will figure T. N. F.'s wall, showing also what we have agreed on as mason's measure and how we calculate quarry measure.

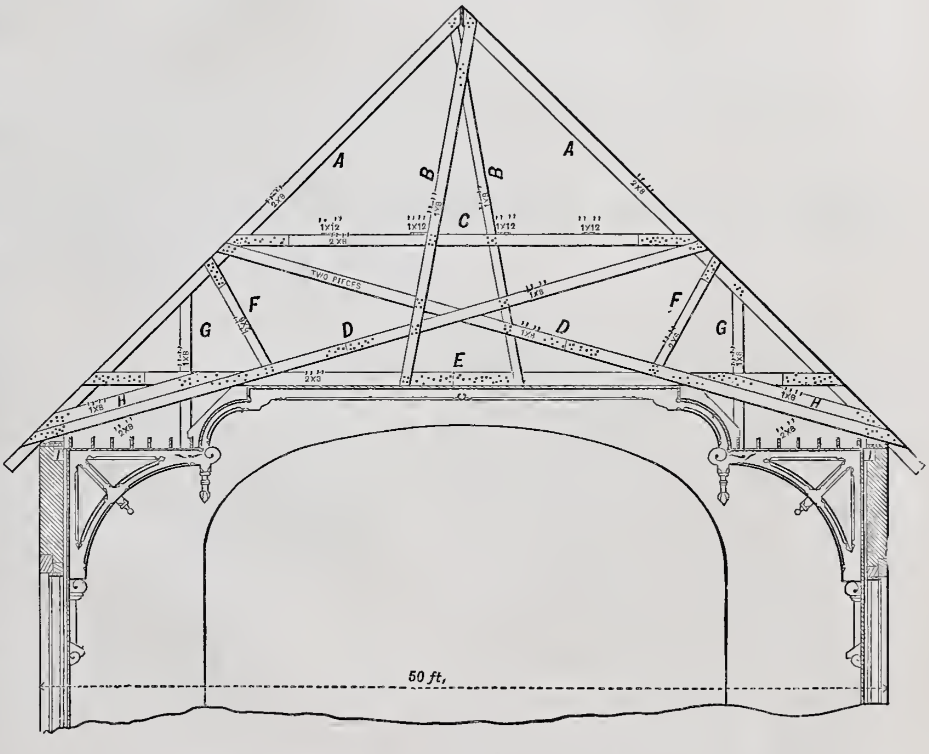
First we will measure for the mason's work, and, as he is to be paid by the perch or per 25 cubic feet of wall, we will begin at the northeast corner, calling the top of the diagram north, holding the line around the corner so as to include the thickness of the wall. We then measure to the northwest corner, paying no attention to the openings when they are less than 8 feet wide, drawing the line taut and level around the corner, and then run thence to the southwest corner. We next go to the southeast corner and include the thickness of the wall, making a length of 89 feet 4 inches. We then come to the center wall and measure it, including the thickness of the two walls against which it abuts. We find that we have here 30 feet 8 inches, making an aggregate of 120 linear feet of wall which is 5½ feet high and 1⅓ feet thick. Therefore, to get the number of cubic feet we multiply 120 × 5½ × 1⅓ = 880 cubic feet. To get the number of perches we divide by 25, and find the result to be 35 1-5 perches. We settle with the mason accordingly.

When the quarryman comes for his pay we proceed to measure up as follows: We begin at the same point as before, but we measure only across the face of the first section of the wall. We have 3 feet 5 inches. We then measure the next and find it to be 3 feet. Then we measure from corner of wall to window and find the distance to be 4 feet 4 inches. We will leave the wall under the window for the present and measure the next space to the corner, which we ascertain to be 7 feet 2 inches. In measuring the west wall we deduct the thickness of the north and south walls. We find the two spaces measure 13 feet and 11 feet 9 inches respectively. Then on the south wall we measure the three sections and find them to be 5 feet 5 inches, 10 feet 8 inches and 4 feet 10 inches respectively. The center wall is measured between the north and south walls and is 28 feet, making an aggregate of 91 feet 7 inches of wall that is 5½ feet high. Multiplying 91 feet 7 inches by 5½ feet, we obtain 503 feet 8½ inches, which is square feet. We next measure the space under the window and find it to be 3 feet 6 inches wide and 4 feet high. Multiply 3 feet 6 inches by 4 feet and we get 14 square feet, which, added to the former quantity, gives 517 feet 8½ inches. This multiplied by the thickness of the wall, 1⅓ feet, gives about 690¼ cubic feet as the contents of the wall. Dividing by 25 feet gives 27 3-5 perches. In short, the actual cubic contents of the wall is the basis of the quarryman's measure, and in this case differs from that of the mason's measurement by 7 3-5 perches. If the sections of wall at the northeast and southeast corners are piers, then we would, in measuring for the mason, girt them half-way round instead of measuring straight across the space between them.

Roof Construction.

From G. P. RANDALL, *Chicago.*—The accompanying drawing of a roof or timber plan for the covering of a town hall, and also showing the construction of a ceiling for the lecture-room of the same, is a copy of one I have designed to be built in an adjacent State. The leading points in it are its lightness and simplicity of construction, and it gives opportunity to utilize a portion of the attic by raising the ceiling of the room up into it. The timber in the roof is light, 2 by 8 inches being the heaviest scantlings in it, and each set of framing as shown here is a truss of itself, and, as used on the building for which it was designed, will be set about 3 feet apart. The boarding of the roof will rest directly on these rafters, to which it should be well nailed, and between each pair of rafters, as shown, there should be an intermediate stag or batten of 2 by 3 or 2 by 4 scantling, to which the boarding should be further nailed.

The stress on the rafters A A and on the straining piece C is one of compression, and that of the inclined ties D D and of the horizontal tie E is one of tension. The straining piece C, horizontal tie E and struts F F are cut off to fit the rafters A A, and then a piece of inch board is stoutly spiked to each side to hold these connections fast. The ties D D are in two lengths, and spliced by inserting a piece of 2 by 8 between the boards of which they are made, and spiked thoroughly on each side the abutting joints. The 2 by 8 tie E is also spliced in the center at E by a board on each side the abutting joint of the 2 by 8. H H are boards on each side to more thoroughly connect the rafter A to the tie E and assist D D. The suspending pieces G G support the timber on which the wall bracket below the ceiling is built, one end of which may be seen in the wall at I I. The thatched section or lines represent the line of lath and plaster. In putting such framings together the rafters A A should be covered about 2 inches, and the whole spiked without stint. On this spiking depends its strength after it has been well designed. It should be lined out on a large floor or platform, and then it requires only a skilled head to direct, and the work of building is very simple. Such trusses as this may be set 2 feet to centers, or, as in this case with a 50-feet span, 3 feet to centers, with a stag piece between the truss rafters to hold the boarding. If used for slate it should be a little stronger or the limits set nearer than for shingles.



Roof Construction.—Roof for a Town Building, Contributed by G. P. Randall.

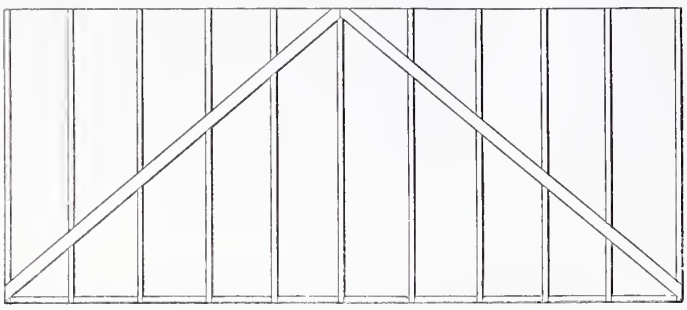
Finishing Hardwood.

From BRIDGEPORT WOOD FINISHING CO., *New York.*—We wish to call attention to a clause in the specification for finishing hardwood published on page 209 of the November issue of *Carpentry and Building.* According to the specification, all hardwood except cherry is to be filled with Wheeler's wood filler and to be finished with four coats of hard oil-finish, applied afterward. We wish to say that where Wheeler's filler is used one, or at most two, coats of hard oil-finish is all that is required. Any more than that would be superfluous or even worse. We contend that the less varnish put upon the surface of wood, providing there is enough to rub on, the better and more durable finish will be produced. Wheeler's filler leaves the surface of the wood perfectly smooth and glass-like. Therefore two coats of oil-finish is all that we would recommend, and in fact is all that it should have. Our process is first to have the wood perfectly smooth. It is then filled and allowed to stand 24 hours. The first coat of oil-finish is then applied, and when it has become dry the second coat of oil-finish is given. When it in turn has become dry, the surface is to be rubbed slightly with pulverized pumice-stone and oil. This is the whole process, and by following it out carefully a much superior and more durable finish will be produced than that called for in the specification above referred to.

We also desire to call attention to the finish of cherry wood. The same specification omits the use of Wheeler's filler in finishing cherry, which we think is a mistake. Wheeler's filler is just as important to use on cherry as on any other wood. Any person who is acquainted with the nature of wood must concede that oil, if applied to raw wood, will destroy the figure and eventually also the color. In fact, it seems to burn the life out of the wood. We manufacture a stain intended expressly for cherry, which gives it a bright and lively color, and if the wood is filled with Wheeler's filler after the stain is applied the color will be retained for years.

Truss Roofs.

From F. S. W.; *Cleveland, Ohio.*—Some time since I had occasiou to build a shop the attic of which I desired to be unobstructed by collar beams. To accomplish this I made the roof in the usual way, with about one-third pitch. Underneath the rafters I nailed on a 6-inch fencing strip, forming a truss, as shown in the drawing. The plates were secured by short boards well nailed across each corner. I used a tie across the center until the truss braces above described were put on, and then took it off. The result was entirely satisfactory. The plates have not spread nor the ridge settled in the least, so far as can be observed. I do not see why large roofs might not be profitably braced in this same general manner. Perhaps this is not a new idea, but I have never seen it used elsewhere. The building referred to was 20 by 28 feet; rafters, 2 by 4 inches, aud spaced nearly 3 feet apart.



Truss Roofs, Contributed by F. S. W.

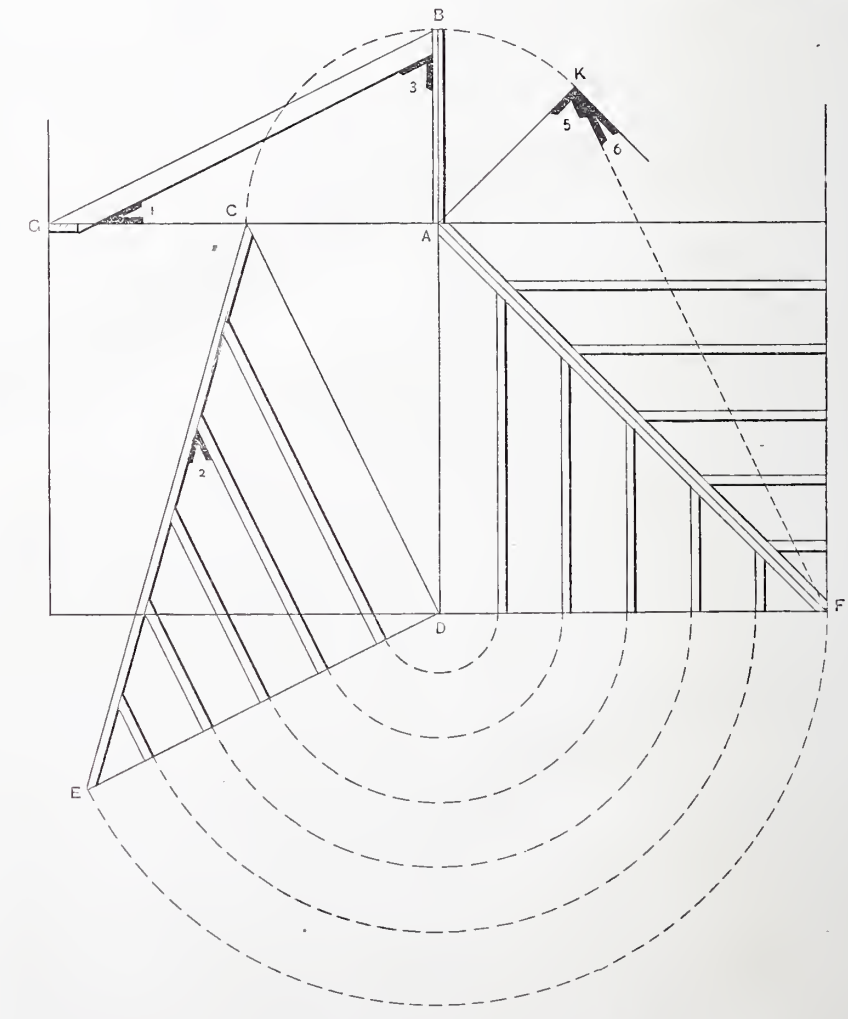
Length and Pitch of Rafters.

From J. A. E., *Tracy City, Tenn.*—Noticing from time to time conflicting ideas upon the part of contributors on the subjects of the length and pitch of rafters, and believing that thus far no reliable or practical rule has been brought forward, I fully coucur in the sentiment recently expressed, that somebody ought to pull the belligerent brethren out and put them on the right road with a guide-board. D. M. W. starts out by giving us an arbitrary rule which, he asserts, is general in its application. J. M. D. kicks this rule over and leaves the author in the mud. J. E. W. kindly tries to pull him out by means of an amendment, and almost succeeds, but "almost is but to fail." W. A. E. makes a fearful charge upon poor D. M. W., and gives him another souse, but lacks half an inch of getting out himself. He finds comfort in the fact that he is not alone in the mud. S. O. E. makes a gallant attempt to draw them all to *terra firma* with a hexagon miter, but he was not careful as to his basis, and so in he goes. In attempting an explanation of the term "pitch" he becomes involved in his hexagon, and carries the whole arc with him in that one step so often heard of.

Now to the point. According to the best authority at haud, the term "pitch," as in present application, is the ratio of the hight to the space. This, too, is the plain and obvious meaning of the term, and is its common acceptation. Therefore, quarter-pitch has for its rise one-quarter the space or width of the building. One-third pitch has for its rise one-third the entire width of the building, &c. I am fully satisfied that a great majoritp of the efficient and enlightened builders within the circle of my acquaintance and observation so explain the term. Among those who are not posted there are various hallucinations concerning the meaning. One I will mention, which was delivered to me in true pedantic airs. It adds to the base-line one-quarter for quarter pitch, one-third for third pitch, &c. The rule of square root being both scientific and accurate, I think the time wasted by tinkers trying to invent some simple method of figuring would be better emp'oyed in learning square root. In conclusion, I will present a method of getting the length of any rafter, or, rather, getting the rafter itself, which I think will commend itself for ease and accuracy. It is purely mechanical, being performed by the the use of the square. For example, required, the rafter for a building, the span of which is 16 feet, the pitch being one-third. Lay off on a straight-edge 8 inches and 12 inches eight times in succession, or, what is the same, 16 inches on the tongue and 24 inches on the blade four times. The blade makes the foot cut, and the tongue gives the head cut. This rule is applicable to any pitch of rafter or bracc.

Construction of a Hip Roof.

From E. D. T., *Stantontown, Ohio.*—I inclose a drawing of a hip roof indicating a method that I have employed for several years past, and which has always proven satisfactory. The most simple forms of hip roofs are those where the ground plan of the building makes right angles. In the ordinary hip roof very little constructive skill is required. The only point deserving particular attention is finding the proper lengths and side cuts of jack rafters. Even this may be made quite simple. For example, let one of the common rafters be given as shown in the sketch. Make A C equal to A B. Join C D. From D draw D E square with D C, making it equal to D F. Join E C. This gives E C as the exact length of the hip rafter on its middle line. Let half the thickness of the hip be set over from E C. We then have a line showing the side cuts of jack rafters. The jack rafters being placed in position over the lengths and side cuts become apparent at once. Bevel 2 in the sketch is applied for side cuts. Bevels 3 and 4 give down and foot cuts for all the rafters. Bevels 5 and 6 on the right show foot and down cut for hip rafter. Bevel 5 is also the correct angle for the backing of the hip rafter. All cuts should be made on the ground in order to insure that each piece of timber when in position shall fit and answer the purpose intended. There is no question about this if the plan has been correctly laid down and worked out. The side cut of the hip can be found by taking the length of the hip on the blade of square and its run on the tongue. Then the blade gives the cut. The side bevel of all the jack rafters can be found by taking the length of a common rafter on the blade and its run on the tongue. The blade gives the result as shown by bevel No. 2.



Construction of a Hip Roof, Contributed by E. D. T.

Architect's Specification.

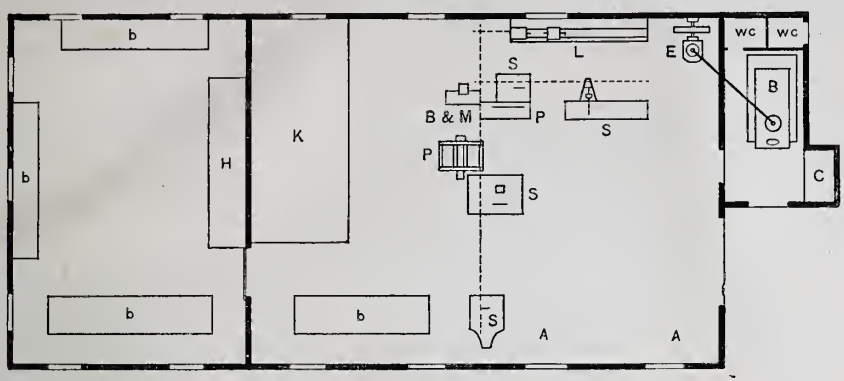
From R. R. P., *Rochester, N. Y.*—In connection with my vote in the seventh competition I want to enter my protest against forcing builders to use a particular make of goods. It looks too much as though they were receiving a commission on them, which of course they would not do. I have suffered many times in this way, and so perhaps am more sensitive about it than I would otherwise be. I like the specification prepared by "Jumbo" the best of any in the list, provided he had finished it in a proper manner. Before he got through he seems to have forgotten what he started out to do, and began writing up dealers of various kinds. The information presented is very good in a general way, but I fail to see how, with any propriety, it can be a part of a builder's specification.

Note.—We commend this subject to the attention of our readers generally. It is one on which every builder has deep convictions,

and also one, a discussion of which will in all probability command the attention of architects and possibly work some good as to their methods.

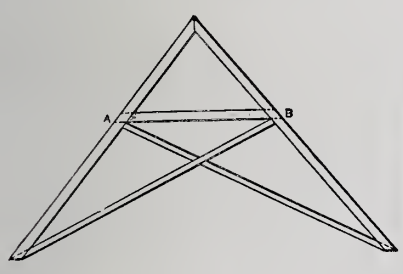
Plan of a Carpenter Shop.

From F. S. W., *Cleveland, Ohio.*—Some time since I noticed an inquiry for a plan of a carpenter shop to accommodate 12 men. I was at the time building a shop which in



Floor Plan of Shop, Contributed by F. S. W.

some respects corresponded to the requirements of the inquirer. Not having it completed, I thought best to wait until I had seen how it would work before making any reply to the question. I have not yet finished all that I intend to do, but have tried the shop sufficiently to satisfy myself that the plan is a good one. The building is 30 by 60 feet, with an addition for boiler of 7 by 16 feet. The roof is trussed so as to leave the room clear below. The machine room is 30 by 40 feet, leaving 20 by 30 feet for benches. This part of the shop is separated from the machine shop by a partition. The front door is in two parts. One of the doors, 3 by 8, is hung with hinges, swinging in to the right. The other, 5 by 8, is hung with rollers at the top. It is also provided with a sash and serves as a window. The flooring opposite the front door is double, to provide for driving in with a team. Referring to the accompanying sketch, A A is the lumber pile, B is the boiler, *b b b* are the benches, C is the coal supply, E is an upright engine for driving the machinery, H is a heating box, K is a dry kiln placed 4 feet below and 2½ feet above the floor line, with cover hung with hinges. The exhaust from the engine connects with the dry kiln, &c., by a pipe passing behind the turning lathe. Live

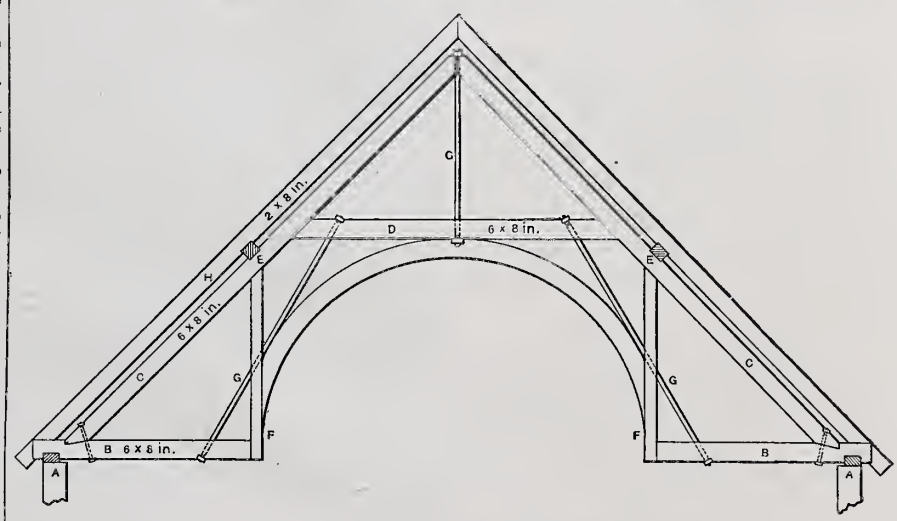


Church Roofs.—Fig. 1.—*Tying and Bridging to Prevent Sagging of Rafters.*

steam can also be admitted to the same pipe in order to utilize the drying kiln when the engine is not running. S S S are saws, the one nearest the lumber pile being a band saw. The others are circular saw, rip and cross-cut saw, cutting-off saw with table and jig saw. P P represents a pony planer and a buzz planer. The belt pulley for the buzz planer stands under the edge of the jig-saw table, in order to save room. B and M are boring and mortising machines combined. The table and the jig-saw table are on a line. The buzz planer and the cutting-off table are on a line with each other. L is the turning lathe. A tenoning machine may be placed behind the cutting off table. Moldings from a sticker may also be run between the lathe and jig saw. The direction of the shafting is represented by the dotted lines. The main shaft is placed about 3½ feet below the floor, so as to connect easily by a quarter-turn belt, and is connected by a level belt with the boring and mortising machine.

Church Roofs.

From F. A. S., *Fitchburg, Mass.*—In reply to T. B., who asks some questions about a church roof in the August number, I would say that I should think any spread of the walls with the roof constructed in the manner he describes would cause it to sag. Perhaps this might be prevented by putting ties from A to B and bridge the same in the manner indicated in Fig. 1. I inclose a diagram, Fig. 2, showing the construction of a roof of a different character, which perhaps will be acceptable to the readers of *Carpentry and*



Church Roofs.—Fig. 2.—*Construction, Submitted by F. A. S.*

Building. A A represents the wall plates, which are 4 by 8 inches. B B is the bottom cord of truss, 6 by 8 inches in section. C C are truss rafters, also 6 by 8 inches in section. D is the top cord of truss of the same dimensions. E E shows the position of the second plates, which are 6 by 6 inches in size and are notched on to the truss rafter. F F are braces framed at the top into C C. G G G are iron rods used in strengthening the truss. Each truss rafter is bolted at the foot to the cord. I would place trusses about 10 feet apart. The roof rafters should be about 22 inches between centers.

Making a Glue Joint.

From F. S. W., *Cleveland, Ohio.*—If the following meets the eye of an apprentice, it may be of assistance to him. To make a glue joint, first see that the plane is true and the iron ground flat across the edge. If the iron is rounding it will make the joint hollow in the center, and therefore it will not hold well. Joint one of the pieces as straight as possible square from the face. Be careful that the joint is not winding from end to end. Generally it is better to joint the lighter piece first, and it is more easily handled for rubbing on to the other when the two are fitted together. Set the second piece in the vise, and plane the edge down as before described until the first piece fits it in all portions, taking especial care that the ends are tight and that the shorter piece does not rock from corner to corner. The two pieces must fit, however, in their entire length, or the joint will not be good. By moving one end slightly it will be easily seen whether the upper piece rides in the center or at the ends. It is not well in most cases to wait to get several joints made before gluing up. The best practice is to glue every piece as soon as it is fitted. If this is not done, a joint will sometimes spoil in a few minutes by exposure to the air or heat. Before putting the joint together it is well to warm both edges with a quick heat. If the pieces are warmed the glue need only be laid on one edge. Before rubbing the joint see that the piece in the vise is firmly held, and not liable to slip or move. Lay on the glue as thick as it can be used without the brush sticking to the wood, taking care that there be no bits of shaving or sawdust on either of the edges. In rubbing down the joint, first rub lengthwise until you are satisfied that the pores of the wood are well filled. Then saw the top piece cornerwise a little, until the glue is rubbed out so that it begins to stick. Then rub lengthwise until the piece is in the right position, taking care that it clings well at both ends.

Painting Canvas Roofs.

One of our readers complains that in painting a canvas roof the quantity of paint necessary to fill the canvas was so enormous, especially in hot weather, that he was quite astounded, using several gallons where he expected to use as many quarts. While this large quantity is an advantage, inasmuch as it is the resisting medium of the roof (and the larger the quantity the better in many respects is the roof), it seems desirable to obtain a coating with a less expenditure of oil and paint. In painting carriages and wagons a very good practice has been to make a quantity of wheat or rye flour paste, and with this give the canvas, after it is laid upon the roof or panel, a good and even coat. The paste should be about as thick as that used for paper-hanging. This will leave the canvas as tight as a drum-head, and, at the same time, fill the surface sufficiently to prevent so great absorption of the oil. Glue size has the same effect and is easily applied. It is said that panels painted in this way are very durable, and that the paint never cracks or scales off. White lead in oil colored with ocher is probably one of the best paints which can be applied upon the roof. Possibly, for the sake of its fire-proof qualities, a final coat or two of mineral paint might be of advantage.

Rule of Double Position.

From D. W. J., *Oakwood, Texas.*—In the tree problem, published in a number of the paper issued in the fall of 1881, I presented a solution based upon this rule, and in a note appended to my letter as published, the reasons for the steps taken were requested. I will attempt to reply by referring to the rule

of double position contained on page 263 of Smith's third book in arithmetic. The rule may be stated as follows: Suppose any two numbers and proceed as if each were correct. Each operation will develop an error. Then say, as the difference of the errors is to the difference of the suppositions, so is either error to the difference between its supposition and the number sought.

Metal for Casting in a Thin Mold.

From H. V. H., *Cleveland, Ohio.*—Can you inform me of some metal or alloy that will cast easily in a thin mold?

Note.—Our correspondent's question is answered so easily that we think he has not given all the particulars in regard to what he wishes. Tpye metal will cast in a thin mold, and it will also make a thin casting. The same is true of some kinds of so-calied britannia metal. In Byrne's book upon metal working there are a great number of alloys mentioned which will fulfill the requirement. Tin and lead in various proportions will answer very well, though we think they are not quite equal to type metal, since they do not fill the mold so well.

Blind Hinges.

From F. G., *Albion, N. Y.*—In answer to the correspondent who presents his difficulties with window blinds in a recent number of *Carpentry and Building*, I would say that the Huffer patent blind hinge will hold the blind at right angles or fully open. It would require a very heavy wind to swing it when left at right angles. The hinge in question is manufactured at Rochester, N. Y., and has had a practical trial of at least six years.

Drawing Ellipses.

Several correspondents, among whom may be mentioned J. H. E., Rochester, N. Y., and D. P. M., Hamilton, Mo., send us sketches illustrating methods of drawing ellipses which have already been published in the paper, and which, therefore, it is hardly worth while to repeat at this time. The plan, judging from the letters of these correspondents, which is most approved by them, is that of two pins, a string and a pencil. This received attention on page 14 of our first volume.

Tools for Stairbuilding.

From F. S. W., *Cleveland, Ohio.*—In reply to E. A. C., Mitchell, Ontario, I would advise him to use few tools and learn to employ them well. For ordinary stair rails, such as plain O G or toad-back, a mallet, one or two common gouges of suitable size, a drawshave, a straight iron spoke-shave ground rounding on the face in front of the iron, so as to go into short work, a scraper with one or two round corners and a good firmer chisel are about all that is needed in molding an ordinary crook. Finish as perfectly as possible before applying the sandpaper. In blocking out the rail, use whatever comes most convenient. I do not use a hatchet. I find that by sawing across the piece at intervals of 3 or 4 inches I can knock off the superfluous wood with a mallet and chisel about as easily as by any other plan.

The Highest Compliment Yet.

From T. A. P., *Walton, N. Y.*—I am very much pleased with *Carpentry and Building*, and really don't think that I could edit it better myself. In this I am not perhaps like some of my brother chips throughout the country.

REFERRED TO OUR READERS.

Sliver Nailing.

From G. L. F., *Milan, Ohio.*—Will some one who has had experience please give me some information with regard to sliver nailing in hardwood finish? What kind of a tool is best for raising the sliver, and how is the sliver held down until the glue is hard?

Millwright's Square.

From J. M., *North Springfield, Mass.*—I desire to find out who manufactures the millwright's square. If any reader of the paper can inform me he will confer a benefit.

STRAY CHIPS.

Messrs. Wesley J. Rose & Co. have recently finished at Johnstown, Penn., a very fine residence for Col. J. P. Linton, at a cost of $9000. The same contractors have also built a new fire-engine house, in the same place, costing $8000. Mr. Jas. K. Boyd made the plans for the former structure, and Mr. H. Moser, of Pittsburgh, Penn., was the architect for the latter improvement.

It is proposed to erect at Milwaukee, Wis., in place of the old Kerby livery stables, on Broadway, a very handsome building. The structure will be four stories and basement in hight, with an elegant glass and stone front. The projectors of the enterprise intend to make it one of the handsomest buildings on that street. The cost is estimated to be not less than $60,000.

Reports reach us that the work on the Enoch Pratt Free Library building, on Mulberry street, near Cathedral, Baltimore, Md., is progressing rapidly, and that the building will be ready for occupancy by June next. The structure has a frontage of 81 feet and a depth of 140 feet. It is built in such a manner as to be thoroughly fireproof, the ratters and girders being all iron, while the floors, with a single exception, will be of stone. The style of architecture is Romanesque, with the characteristic semicircular forms, relief moldings, &c. The front of the structure, from the ground line to and including the cornice, is of Baltimore County white marble. In the center of the façade rises a tower 98 feet in hight. In this tower, above the second story, will be placed three allegorical representations of Poetry, History and Elocution. In the spandrels formed by the circular windows on each side of the tower are busts of Shakspeare, Scott, Franklin, Irving and Webster, all of Italian marble. It is estimated that the capacity of the library will be about 250,000 volumes. Mr. Charles L. Carson is the architect and Messrs. S. H. & J. F. Adams are the builders The superintendent of construction is Herman Cording.

The Union Depot and Storage Co., of St. Louis, Mo., have completed a five-story elevator, besides extensive warehouses for merchandise. The cost of the elevator was $100,000.

At Fargo, Dakota Territory, Mr. E. S. Tyler has about completed a very fine residence for himself, at a cost of $30,000.

At Detroit, Mich., a new passenger depot is to be erected on the site of the old building by the Michigan Southern Railroad Co. The dimensions of the structure will be about 200 by 600 feet in plan, built of brick with stone trimmings. The sheds will be of iron. The cost is estimated to be in the neighborhood of $200,000.

Lexington, Ky., is to erect a courthouse after plans designed by Mr. Thomas W. Boyd, of Pittsburgh, Pa. The structure will be of stone, and the contract price is $91,000,

A company has recently been formed for the express purpose of lighting the residences and mercantile establishments of Oshkosh and Fond du Lac, Wis., by means of the electric light. The company have a capital stock of $750,000.

Mrs Edgar Ames is erecting, at the corner of Seventh street and Lucas avenue, St. Louis, Mo., a six-story brick structure intended for use as a store. Over 1,500,000 bricks, costing $20,000, have been used in the construction of the building.

A correspondent sends us the following clipping from *Punch*: A friend from Rome informed Mrs. Ramsbotham that, among other things, he had recently seen Cardinal Lavigerie take possession of his titular church of "St. Agnes-Without-the-Walls." "Saint Agnes without the walls!" exclaimed Mrs. Ram. "How on earth is the roof kept up?"

At Johnstown, Pa., the contract has been let for two schoolhouses to be erected during the coming year, and to cost $16,000 each. Messrs. W. J Rose & Co. are the contractors and builders, and Mr. H. Moser, of Pittsburgh, Pa., is the architect.

The Belcher Sugar Refining Company, of St. Louis, Mo., have been making somewhat extensive additions to their works. One of the buildings that they have just completed is 12 stories above the sidewalk.

One of our correspondents writes that the St. Louis machine-made stock bricks are becoming somewhat famous on account of their beauty and general excellence They are extensively used in the adjacent States, and some are even sent as far as Dakota Territory and Manitoba. There is a fine opening in St. Louis for brick manufacture, the quality of the clay being specially suited to this purpose.

Mr. J. J. Steager has recently completed, at Johnstown, Pa., a store and dwelling for the Hager estate, the cost of the improvements being $10,000.

St. Paul, Minn., has a new State capitol building that is rapidly nearing completion. The plans for this handsome edifice were submitted by Mr. L. S. Buffington, and the foundation was laid in the spring of 1881 The later months of that year proving unfavorable for the prosecution of building operations, the raising of the superstructure was deferred until the present year. The first brick was placed in position on the 4th day of last April, and the masonry was completed a few weeks since by the laying of the capstone on the tower by Governor Hubbard with appropriate ceremonies. When completed according to the plans this tower will be surmounted by a dome of beautiful design, but for the present it will be covered with a temporary roof. The ground plan of the building measures 154 by 132 feet. The main walls are 60 feet from the foundation, and the tower extends 65 feet above the roof. When finished the distance from the foundation stone of the tower to the top of the dome will be about 200 feet. The structure contains 4,000,000 bricks and 12,000 square feet of cut stone. The cost of the building, when completed in all respects, will be not far from $275,000.

There is in progress of erection at Manistique, Mich., a new hotel building that is to be known as the Ossawinamakee House.

Mr. Edward J. Gay, of St. Louis, Mo., is constructing, at the corner of Third and Pine streets, what is intended to be a fire-proof building. The structure will be seven stories in hight, and will be be used for stores and offices. The floors consist of wrought iron I beams, filled between with hollow arches of cement concrete. The interior partition walls are of brick. The estimated cost is something over $100,000.

Messrs. Hubbard, Bakewell & Co., of Pittsburgh, Pa., have recently completed their new ax factory. The buildings are three in number, and are 300 x 56 feet, 348 x 40 feet and 228 x 50 feet, respectively.

It is proposed by the Cauada Southern Railway to erect, at the Windsor, Mich., terminus of the Essex Center cut-off, an extensive freight depot and roundhouse.

The project for a new Union Depot at St. Louis, Mo., after having been several times apparently abandoned, is again revived, with good prospects of success. Considerable ground has been secured near Clark avenue and Eighteenth street, and the preliminary plans for a building 500 feet in width and about 1500 feet in length have been sketched, The depot is to be constructed on the "end plan," all trains arriving and departing from the rear, while the approaches to the trains are from the front end of the building. It is probable that the contract will be given out at an early day.

At Elgin, Ill., an addition is being built to the hotel of the Elgin Watch Company that will give an added capacity of 150 rooms and a new dining hall. The cost of the improvements is estimated to be about $30,000.

At Muskegon, Mich., the contract has been let for a new hall for the German Workingmen's Society. The structure will be of brick and the contract price is $7000.

In Milwaukee, Wis., Messrs. O. D. Bjorquist & Sons are to put up a handsome four-story brick block, to be used for their wholesale boot and shoe business. The structure will be 40 x 110 feet in plan, with a modern front of Philadelphia red brick and white sandstone trimmings. The cost will be in the neighborhood of $23,000, and it is expected that the building will be ready for occupancy by the 1st of April next.

The Missouri Car and Foundry Company, of St. Louis, Mo., whose works were nearly destroyed by fire a short time since, are arranging to rebuild as rapidly as possible. The blacksmith shop is to be 50 x 150 feet in plan, the wood-working shop 75 x 200 feet, and others in proportion. Mr C. E. Illsley, of St. Louis, is the architect.

Building operations in Chicago, Ill., still continue, and the outlook for the immediate future, judging from the number of building permits that have been issued during the past few weeks, is quite promising. Among some of the important structures that are in progress of erection is a six-story building 91 by 162 feet in plan, by Messrs. Smith, Gaylord & Gross, to cost $90,000; a dancing academy 50 by 127 feet, by Prof. A. E. Bournique, to cost $30,000, and residence 45 by 65 feet, by Charles Mason, to cost $12,000.

There has recently been erected, on North Eutaw street, Baltimore, Md, a building that is to be used by the Western National Bank. The structure is 55 feet 6 inches by 85 feet in plan. The material used in the construction was brick laid in cement upon a granite base, with trimmings and bands of Cheat River bluestone and coverings of red sandstone. The style of architecture is the Renaissance, with bold and lofty arched windows and doorway. The main room is 45 by 65 feet, with a ceiling 45 feet in hight. Within the large main hall are the president's room, 13 by 16 feet; casbier's room, 9 by 14 feet; depositors' room, 12 by 12 feet; directors' room, 15 by 24 feet, book room, 15 by 15 feet, and toilet-room, 13 by 15 feet. The hight of the ceiling in these rooms is 20 feet. At the rear of the counting apartment is a vault 9 by 14 feet in the clear, built of brick laid in solid cement. The floors and roof are constructed of iron, upon which are laid tiles and slate. The building is heated by steam from the basement. The architect was Mr. Charles L. Carson, and the building was constructed under the superintendence of William Ortwine. The edifice is something of a novelty in its way, and cost nearly $70,000.

Mr. B. P. Moulton, of Chicago, Ill., has in course of erection, on Prairie avenue, north of Twentieth street, a residence that will cost, when completed, $75,000.

Messrs. Harper Brothers, the well-known New York publishing firm, are about to erect in Cincinnati, Ohio, a nine-story building on one of the most prominent streets. The structure will be pressed brick, and in all respects carefully adapted to the purpose for which it is intended.

At Clinton, Ill., the erection of a tile factory will soon be commenced. The capacity of the establishment will be 12 miles of tile per week. The investment will be some $15,000.

Jamestown, Dakota Territory, is to have a big hotel building as soon as the money ($100,000) can be raised. So far, $80,000 has been promised.

At Black River Falls, Wis., Hon. W. T. Price is putting up a residence that is estimated to cost, when completed, $50,000.

GETTY CENTER LIBRARY